CI2018
EMERGING ISSUES

CI2018 DC Podium and Poster Highlight Abstracts

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-1: Evolving Candidacy
Abstract ID: 23
Title: Cochlear Implantation in Cases of Unilateral Hearing Loss: Quality of Life
Authors:
Margaret Dillon, AuD 1, Emily Buss, PhD 1, Meredith Rooth, AuD 1, English King, AuD 2, Kevin Brown, MD, PhD 1, Harold Pillsbury, MD 1; 1Otolaryngology/Head and Neck Surgery, Univ. of North Carolina at Chapel Hill, Chapel Hill, NC, 2Audiology, UNC HealthCare, Chapel Hill, NC.
Abstract:
Introduction: Patients with moderate-to-profound unilateral hearing loss (UHL) experience poorer quality of life as compared to normal hearers. Current treatment options, including bone-conduction devices and CROS hearing aids, route the signal from the affected side to the normal hearing ear. This listening condition limits the ability to use binaural cues for improved spatial hearing. Patients may experience improved quality of life with use of a cochlear implant (CI) in the affected ear. Quality of life assessment before and after cochlear implantation may reveal changes to aspects of hearing beyond those explicitly evaluated with behavioral measures.
Methods: Twenty subjects with moderate-to-profound UHL underwent cochlear implantation of the affected ear as part of a clinical trial investigating outcomes of this new indication over the first year of device use. The present report completed two experiments investigating quality of life in this cohort. The first experiment assessed quality of life during the first year of device use with three questionnaires: the Speech, Spatial, and Qualities of Hearing Scale (SSQ), the Abbreviated Profile of Hearing Aid Benefit (APHAB), and the Tinnitus Handicap Inventory (THI). Subjects were evaluated preoperatively, and at one, three, six, nine, and twelve months post-activation. The second experiment evaluated quality of life with the APHAB preoperatively and at the 12-month interval for CI recipients with UHL and CI recipients with bilateral hearing loss, including conventional CI users and those listening with Electric-Acoustic Stimulation (EAS).
Results: Subjects with UHL demonstrated a significant improvement in quality of life after receipt of the CI, with benefits noted as early as one month after initial activation. The UHL cohort reported less perceived difficulty at the preoperative and postoperative intervals than the conventional CI and EAS cohorts, which may be due to the presence of the normal-hearing ear. The magnitude of the benefit with the CI was similar between groups on the Background Noise subscale. Therefore, hearing in the contralateral ear did not influence the magnitude of the benefit achieved with CI use in challenging listening situations.
Conclusion: Cochlear implantation in cases of substantial UHL may offer significant improvements in quality of life. Quality of life measures revealed a reduction in perceived tinnitus severity, and subjective improvements in speech perception in noise, spatial hearing, and listening effort. While self-report of difficulties was lower for the UHL cohort as compared to the conventional CI and EAS cohorts, subjects in all three groups reported an improvement in quality of life with CI use.

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Session: S1-1: Evolving Candidacy
Abstract ID: 27
Title: Cochlear Implant Candidates with Non-Organic Hearing Loss
Authors:
Martin Kompis, MD, PhD, Georgios Mantokoudis, MD, Marco Caversaccio, MD;Inselspital, Univ. of Bern, Bern, Switzerland.
Abstract:
Introduction: Patients who present themselves with a considerably poorer hearing in the psycho-acoustical hearing test than can be confirmed by objectives measure are well known. In the last decades, we have witnessed a new group of patients with non-organic or psychogenic hearing loss with the additional explicit wish to receive a cochlear implant (CI). Our aim was to describe this phenomenon and to gain first insights into the characteristics of this group.
Methods: Chart review of all CI candidates for a continuous period of 10 years. We found 4 CI candidates who wished to receive a cochlear implant and who presented themselves with hearing threshold above 80 dB in routine audiometry, but showed considerably (i.e. 50 dB or more) better thresholds when using objective measures.
Results: All 4 CI candidates found were female and aged between 23 and 51 (average 39.5 years). Their hearing thresholds in pure tone audiometry ranged from 86 dB to 112 dB HL (pure tone average 500 Hz to 4000 Hz). In contrast, auditory brainstem responses (ABR) and otoacoustic emissions (OAE) suggested bilaterally normal hearing in two subjects, and hearing thresholds between 30 and 50 dB in the other two subjects. The histories of the subjects showed several similarities. 3 suffered from depression, 1 woman believed to have cancer, which could not be confirmed. Three had a history of more than 5 or more previous surgeries. 3 were smokers and 3 reported other close family members with hearing losses. All were bilateral hearing aid users at the time of presentation. In one case, no OAE were present and the psychogenic part of the hearing loss was objectively confirmed by ABR.
Conclusion: Psychogenic hearing loss in order to receive a cochlear implant is a relatively new phenomenon. It seems to be rare but stresses the importance to confirm the hearing threshold with by measuring auditory brainstem responses. Numerous previous surgeries, depression or other psychiatric disorders may be overrepresented in this group.

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Session: S1-1: Evolving Candidacy
Abstract ID: 149
Title: Bimodal and Bilateral Benefit in Adults Using Cochlear Implants: Towards Evidence-Based Guidelines for Recommending Bilateral Implantation
Authors:
Richard C. Dowell, PhD 1, Sylvia Soong, MClinAud 1, Jaime R. Leigh, PhD 1, Rod Hollow, MSc 2, Agnes Au, PhD 1; 1Audiology and Speech Pathology, Univ. of Melbourne, Parkville, Australia, 2Cochlear Implant Clinic, Royal Victorian Eye and Ear Hosp., East Melbourne, Australia.
Abstract:
Introduction: Benefits have been documented for the use of cochlear implants (CIs) with hearing aids and for bilateral implants in terms of speech perception in quiet, localization, and speech perception in noise. Adults with a first CI proceed with a second CI based on perceived benefit, cost/insurance issues and surgery risks. It has been difficult to provide recommendations regarding the potential benefit of a second CI for an individual who uses a hearing aid in the non-implanted side. This study makes an initial attempt to quantify results for bimodal and bilateral CIs in adults and provide a guide to advising those considering a second CI.
Methods: Speech perception outcomes were reviewed for 1393 adults with acquired hearing loss who received a cochlear implant consecutively between 2000 and 2015. This unselected sample included 487 who used their first CI alone, 639 who used their first CI with a hearing aid on the contralateral side and 267 who went on to have a second CI.
Results: Bimodal benefit for speech perception averaged 13.0% for CNC word scores and 12.8% for CUNY sentences in 10dB SNR. There were significant but weak relationships between the degree of bimodal benefit and pre-implant speech perception scores in the non-implanted (better) ear. Bilateral benefit averaged 19.4% for CNC words and 19.0% for CUNY sentences in 10dB SNR. Regression analysis suggested that CI users scoring less than 20% for CNC words in the non-implanted ear are likely to perform better with a second implant.
Conclusion: This analysis of speech perception outcomes for a large unselected group of adult CI users indicates that the use of a hearing aid or a second cochlear implant provides significant benefit over unilateral CI. The results suggest that CI users scoring less than 20% on CNC words in the non-implanted ear would have a good chance (>75%) of benefiting from a second implant. Consideration of many other factors including age, hearing goals, medical factors, and the risk to residual hearing also need to play a part in recommending a second CI.

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Session: S1-1: Evolving Candidacy
Abstract ID: 172
Title: Is the Referral Pathway a Barrier to Candidacy Evaluation for Cochlear Implantation in Adults with a Postlingual Severe to Profound Hearing Loss?
Authors:
Valerie Looi, PhD 1, Cleo Bluett, M Audiology 2, Isabelle Boisvert, PhD 2; 1SCIC - A Service of RIDBC, Sydney, Australia, 2Linguistics, Macquarie Univ., Sydney, Australia.
Abstract:
Introduction: It is well accepted that the penetration rate of cochlear implants (CI) in postlingually deafened adults is low. In Australia, despite multiple factors leading to it having one of the higher CI penetration rates in the world, it is estimated that this rate is less than 10%. That is, less than 1 in 10 adults who could benefit from a CI actually get one. Many barriers may contribute to this low penetration rate, including referral pathways and access to information.The overall aim of this study was to evaluate the referral pathway from a hearing aid (HA) clinic to CI candidacy evaluation, in Australia. Specifically, this study sought to investigate the referral rates of postlingually deafened adult CI candidates from a HA clinic for a CI candidacy assessment, and to gain insight into factors that may influence the CI referral pathway.
Methods: There were two parts to this study: 1) The database of a HA aid clinic was reviewed for adult clients with a severe or worse postlingual hearing loss (PTA >/= 65 dB HL) and unaided phoneme recognition scores of ≤50% correct in the better hearing ear, who had a hearing test in the 16 months prior to this study commencing. Files meeting these criteria were individually reviewed to further assess whether a CI discussion had taken place during the appointment, and the outcomes of this discussion. 2) An online questionnaire was also distributed to clinicians within that HA clinic, covering topics such as knowledge of the CI candidacy criteria, typical CI outcomes, factors affecting their decision to refer for candidacy assessment, and their general thoughts of the referral pathway.
Results: 1249 files were reviewed, of which 18 adults met the pre-determined CI referral criteria. From these 18 adults, 16 (89%) had a CI discussion with their audiologist, and 11 (61%) were formally referred for a CI evaluation. Of these 11, four proceeded to implantation, suggesting a penetration rate of 22% for this study. Questionnaire responses revealed the need for better information on candidacy and referral guidelines for HA audiologists, in addition to enhanced communication between HA and CI clinics.
Conclusion: Results indicate that the referral pathway to obtain a CI candidacy assessment is a barrier contributing to the low CI penetration rate in adults.

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Session: S1-1: Evolving Candidacy
Abstract ID: 204
Title: Clinical Application of the TEN (HL) Test to Evaluate Borderline Cochlear Implant Candidates
Authors:
Rachel McOmish, MACochlear Implant Department, Royal Throat Nose and Ear Hosp., London, United Kingdom.
Abstract:
Introduction: Multi Disciplinary Teams (MDT) in the United Kingdom use the National Institute for Health and Care Excellence (NICE) guidelines to assist their decisions regarding suitable cochlear implant candidates. There are an increasing amount of candidates who are considered 'borderline' as they fall outside of the audiological threshold criteria and/or the Bamford–Kowal–Bench (BKB) sentence test criteria.From measurement of the audiogram alone, it is not possible to determine what proportion of the hearing loss is due to hair cell damage. Moore et al, designed the TEN (HL) test to diagnose dead regions in the cochlear. The test was designed to be quick and easy to administer and hence suitable for use in clinical practice.
Methods: A retrospective chart review was undertaken at the Royal National Throat Nose and Ear Hospital in London, United Kingdom, to assess what proportion of 'borderline' adult patients that had dead regions identified by TEN (HL) test were approved by the MDT as suitable cochlear implant candidates. For those candidates that had cochlear implant surgery, pre-implant BKB scores were compared with scores at one year post-implant.
Results: Results indicated that the majority of patients that had suspected dead regions identified in the TEN (HL) test were approved as cochlear implant candidates. Overall, recipient's BKB scores post-implant showed an improvement when compared with pre-implant scores.
Conclusion: The TEN (HL) test can be used as a useful clinical tool for 'borderline' patients. It can be an indicator that a patient with dead regions would likely to do better with a cochlear implant than with a hearing aid. The TEN (HL) test should be added to the routine assessment test battery for all pre-implant patients.

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Session: S1-1: Evolving Candidacy
Abstract ID: 230
Title: Speech Recognition Performance in Older Adults with Normal Hearing: Age-Normative Performance on AzBio, BKB-SIN, and QuickSIN
Authors:
Jourdan T. Holder, AuD 1, Laura M. Levin, BS 1, René H. Gifford, PhD 2; 1Hearing and Speech Sciences, Vanderbilt Univ. Med. Ctr., Nashville, TN, 2Hearing and Speech Sciences, Vanderbilt Univ., Nashville, TN.
Abstract:
Introduction: Three clinical measures, AzBio sentences, BKB-SIN, and QuickSIN tests, are commonly used to determine cochlear implant (CI) and hearing aid (HA) candidacy and track post-intervention changes in speech understanding. However, there are currently no age-normative data for AzBio sentence recognition as a function of listener age. Collection of normative data is necessary in order to appropriately guide candidacy criteria and to establish appropriate goals and expectations for adult CI and/or HA users. The objective of this study was to characterize the performance of older adults with normal hearing on clinical measures of speech recognition in noise.
Methods: Eighty adults with normal hearing (≤ 25 dB HL at 250 - 4000 Hz) and cognitive function were recruited evenly across four age groups (<50, 50-59, 60-69, and 70+ years) to examine age effects on speech recognition performance. All adults completed the AzBio sentence test at six signal-to-noise ratios (SNRs) (Quiet, +10, +5, 0, -5, and -10 dB), the BKB-SIN test, the QuickSIN test, and the quick spectral modulation detection (QSMD) task, presented in the soundfield.
Results: Mean AzBio sentence recognition approached ceiling when presented in quiet, +10, and +5 dB SNR for all age groups. At more difficult SNRs, performance decreased, and a significant difference between age groups was observed. Mean BKB-SIN SNR-50 scores for each group were -2.26 dB (<50), -1.32 dB (50-59), -1.09 dB (60-69), and -0.54 dB (70+). Mean QuickSIN scores for each group were -0.92 dB (<50), -0.05 dB (50-59), -0.66 dB (60-69), and 0.18 dB (70+). Mean QSMD scores (1 cyc/oct) for each group were 93% (<50), 88% (50-59), 84% (60-69), and 87% (70+). An effect of age group was observed for all test conditions except for AzBio Quiet, +10, and +5 dB SNR.
Conclusion: Adults with normal hearing perform at ceiling for AzBio sentence recognition in SNRs used for assessing candidacy and outcomes for adult CI and HA users in the clinic (> 0 dB SNR). Thus, the decrement in performance at positive SNRs commonly observed in an adult population with moderate to profound sensorineural hearing loss is inconsistent with the performance measured in adults with normal hearing. However, older adults with normal hearing show an increased deficit for processing speech in noise at more difficult SNRs, even when hearing loss is controlled—an effect well described in the literature. Thus, speech recognition in noise might be expected to decrease in a similar pattern for the CI and HA populations across comparable ages. Lastly, results indicating near-perfect performance on clinically relevant tasks in the oldest age group should be considered when selecting the clinical measures and presentation levels used for CI and HA candidacy and outcome assessments, as these results support continued efforts for expanding our reach to broader populations of adults with hearing loss and improving outcomes.

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Session: S1-1: Evolving Candidacy
Abstract ID: 243
Title: Shifting Focus: Using Functional Listening Skills to Guide Paediatric Cochlear Implant Evaluation
Authors:
Aleisha Davis, MPhil, MSLP 1, Robert Cowan, Prof 2, Elisabeth Harrison, Dr 3; 1The Shepherd Ctr., Sydney, Australia, 2HEARing CRC, Melbourne, Australia, 3Macquarie Univ., Sydney, Australia.
Abstract:
Introduction: A child's world is a noisy place. Increasingly parents and professionals are looking for more information than an audiogram and speech perception results can provide to understand the development of their real world listening skills in order to make decisions about cochlear implantation, and support intervention choices. Knowing more about a child's access to and use of sound in their everyday environments, outside of the booth or therapy room, provides this valuable information that can guide the critical decisions needed to support the candidacy process. Based on formative auditory scales, the Functional Listening Index-Pediatric (FLI-P) was developed to provide a measure of a child's functional listening development from birth through to 6 years of age, from early through advanced listening stages. Items cover auditory skills in natural settings that underpin language, literacy, communication development and social competence, including listening from a distance and in noise, and understanding the subtleties of language conveyed through audition.
Methods: A retrospective analysis of use of the FLI-P with over 500 children with hearing loss in a cochlear implant and early intervention program was conducted. Results will be reported since its adoption by the program as an integral part of cochlear implant evaluation for 50 infants and young children. Group analysis was undertaken comparing children with different levels and types of hearing loss using a range of devices. Specific analysis of age of implant (from under 6mths of age) was examined, in conjunction with listening outcomes of children with cochlear implants with additional needs; different family contexts; learning more than one language; with ANSD; and with SSD. The trajectory of their functional listening skills were analysed to determine the impact of their listening level on their communication development.
Results: Data indicate strong levels of concurrent validity and expected differences between groups. Differences in individual trajectories provide strong evidence for early evaluation and amplification decisions. Outcomes post implantation were indicated on the FLI-P sooner than in standardised speech and language scores. FLI-P scores at 3yrs were shown to be predictive of language outcomes at 5yrs of age.
Conclusion: Integrating a measure of functional listening as a critical component of Cochlear Implant evaluation provides the opportunity to bring a child's real world listening skills into candidacy considerations and quantify cognitive components of auditory skill development in a meaningful and contextual way for families. Use of the FLI-P has demonstrated a level of sensitivity to discrete changes and acquisition of listening skills that can be incorporated into a child's audiological profile and support parents and clinicians in early choices and informed decisions throughout implant evaluation and post-operative progress.

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Session: S1-1: Evolving Candidacy
Abstract ID: 15
Title: Effect of Cochlear Implant Candidacy Delay on Speech Perception Outcomes in Children with Hearing Loss
Authors:
Elizabeth L. Perkins, MD, Lisa R. Park, AuD, Kevin D. Brown, MD, PhD;Otolaryngology, Head and Neck Surgery, Univ. of North Carolina at Chapel Hill, Chapel Hill, NC.
Abstract:
Introduction: Timing of second-side cochlear implantation in children with residual acoustic hearing is a difficult clinical decision that balances the loss of residual hearing with the benefits achieved with cochlear implantation. Specific audiologic criteria for consideration of second-side cochlear implantation do not exist (outside of manufacturer's labeling), and there is limited data on the implications of delaying implantation. We wished to determine the impact of time interval after reaching a conservative CNC word score criteria of 40% or less.
Methods: 61 bimodal children who underwent sequential, second-side cochlear implantation (>1 year experience) were identified. Differences in CNC word scores of the second device compared to the first device were determined (each subject acts as own control). Linear regression analysis was performed comparing differences with length of time elapsed after an aided CNC word score of less than 40% was reached preoperatively.
Results: CNC differences plotted against time interval demonstrated a highly significant negative correlation between interval and CNC word score outcome ($p = 0.0052$). Subjects delaying implantation after reaching conservative candidacy criteria were far more likely to have a poorer outcome in their second ear compared to the first ear. Multivariate analysis did not identify any other influencing co-factors.
Conclusion: These results suggest delaying CI after reaching a conservative CNC candidacy of less than 40% leads to worse outcomes in children receiving a second implant. Parents of children with hearing loss should be advised of the risk of delaying implantation beyond this conservative standard.

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Session: S1-2: Parental Role in Child Outcomes
Abstract ID: 53
Title: Using Strengths Based Coaching with Parents to Impact Device Wear Time in Pediatric Patients
Authors:
Erika Gagnon, AuD, Holly F. B. Teagle, Doctor of Audiology, Jennifer Woodard, Doctor of Audiology;The Univ. of North Carolina at Chapel Hill, Durham, NC.
Abstract:
Introduction: Over the past two years our center has utilized a "co-treating" clinical model for pediatric patients. A speech-language pathologist pushes into each audiology appointment for children birth to three years, to aid in access to Listening and Spoken Language Specialist. Both audiologists and speech-language pathologists have been trained in strengths based coaching practices based on the principles of adult learning theory, positive psychology, appreciative inquiry, and Non-Violent Communication. These approaches have been applied via the "co-treating" model to help engage parents in audiology appointments. As our center focused on children birth to three, a common theme and challenge across co-treating sessions was device wear time. Datalogging, or tracking a patient's hearing technology wear time, is a recent update for current generation external speech processors. At our center, device wear time increases with a child's age but reveals reduced use for children birth to three. As practitioners, does how we counsel and approach parents regarding device wear time impact results? Does using strengths based coaching in a co-treat model yield increased device use over children seen without the co-treat model? The objective of this study is to examine wear time across children of all ages with emphasis on trends in the birth to three population. Case studies will be presented with impact of "co-treating" model on device wear time.
Methods: A retrospective chart review examined over 300 cochlear implant recipients with external speech processor capable of datalogging, these patients ranged in age from birth to 21 years. Data logging measures were obtained across single or multiple routine visits.
Results: Results reveal a wide range of wear time across ages, with average daily cochlear implant use increasing with age. Case studies will be presented illustrating the benefits and limitations of the "co-treat" model when counseling about device wear time for children birth to three.
Conclusion: Similar to longitudinal studies of hearing aid patients, children utilizing cochlear implants show increased device use as they age. Specifically, children birth to three have unique concerns with device retention and wear time. Highlighting success and progress using the strengths based "co-treating" model has allowed our center to increase dialogue with parents regarding the distinctive needs of this population.

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Session: S1-2: Parental Role in Child Outcomes
Abstract ID: 75
Title: A Mixed Methods Investigation of Conversational Turn Taking
Authors:
Hillary Ganek, PhD 1, Stephanie Nixon, PhD 2, Ron Smyth, PhD 3, Alice Eriks-Brophy, PhD 2; 1The Hosp. for Sick Children, Toronto, Canada, 2Univ. of Toronto, Toronto, Canada, 3Univ. of Toronto Scarborough, Scarborough, Canada.
Abstract:
Introduction: Many organizations from the high-income countries have begun professional training programs in low- and middle-income countries to close the gap between those who need intervention for pediatric hearing loss and those who can provide it. Unfortunately, the strategies being promoted through such training may conflict with local language socialization practices, (Crago, 1992; Schieffelin & Ochs, 1986). This study compares the interactions of families of children with and without hearing loss in Vietnam to those used in Canada as an example of how language socialization practices influence parent-child talk in order for speech-language pathologists to create more individualized interventions.
Methods: Data was collected from children between 18 and 48 months old with and without hearing loss in Canada and Vietnam. Language ENvironment Analysis (LENA) System software automatically analyzed each recording to calculate a conversational turn count (CTC). CTC alone, however, was not sufficient to provide a usable explanation for why differences between the two cultural groups may exist. Qualitative interviews were therefore conducted with the children's parents. A Thematic Analysis (Braun & Clarke, 2006) was performed to identify patterns within the interview data, and the resulting themes were used to elaborate on the quantitative findings.
Results: There was a statistically significant difference between the CTC of Canadian and Vietnamese children with and without hearing loss ($U=27$, $p=.016$; $U=217$, $p<.001$). There was no difference between the two Vietnamese cohorts ($U=108$, $p=.218$) or the two Canadian cohorts ($U=31$, $p=.140$). Interviews with Vietnamese caregivers revealed that these parents focused on developing their child's intelligence, while Canadian participants discussed building their child's identity. Regardless of cultural background, all of the participants interviewed agreed that children with hearing loss should be treated similarly to their hearing peers. As such, parents of children with hearing loss in both groups engaged in the same number of turns per day as their typically hearing peers. The language socialization practices identified through the interviews thus provide an explanation for the differences and similarities identified in the LENA CTC results.
Conclusion: This is the first mixed-methods study to combine LENA findings with qualitative results in an examination of language socialization practices in two cultures. Results benefit Vietnamese families receiving speech-language therapy and the professionals serving them. The findings from this project demonstrate the importance of considering language socialization practices in intervention for children with hearing loss. Integrating culturally appropriate language socialization practices into speech-language therapy will allow more children with hearing loss to become fully participating members of their families and cultural communities.

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Session: S1-2: Parental Role in Child Outcomes
Abstract ID: 86
Title: Beyond Implantation: Parental and Student Engagement from Birth to Graduation in the Public Schools
Authors:
Christy Hiergeist, MS, LSLS Cert AVT, CED, Alison Hefferan, M.A., CCC-SLP; LSLS Cert. AVEd.;Hearing and Language, Delaware County Intermediate Unit, Morton, PA.
Abstract:
Introduction: Children receive cochlear implants at different ages with the goal being the earlier the better. Regardless of when a child receives a cochlear implant, specialists should be involved in the habilitation/re-habilitation in order to maximize the listening and spoken language potential for each child. Parents are involved from those very first days as language facilitators. There are a lot of resources to help parents during those early years but even after a child has learned how to talk using their implant(s), a need for service remains as the students and parents navigate the public school system and eventually higher education. We will offer suggestions to keep parents involved through the multiple transitions that occur throughout a child's educational career and eventually empower the students themselves to become their own advocates as they reach adulthood.
Methods: Introduce participants to strategies used in a public school program for children with hearing loss through case studies involving families at different stages in their child's development. Share survey results from parents of students who are in high school or recently graduated.
Results: Parents and students recognized a need for a continuum of support services over the course of their educational careers. There are many wonderful resources available for families with infants and young children who are learning to listen and talk with cochlear implants. However once children enter school, the speech language pathologists, teachers of the deaf, audiologists and listening and spoken language specialists who worked together to help families transition into a world of using hearing technology, sometimes take a back seat to regular education teachers. Teaching the skills that focus on advocacy and independence into young adulthood, including support from other agencies (guidance, vocational rehabilitation, and university disability coordinators) is an essential piece of a successful program.
Conclusion: The strategies change as children develop, but the results indicate that there is a need for engagement and support at all stages of life for children with cochlear implants in order for them to be successful.

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Session: S1-2: Parental Role in Child Outcomes
Abstract ID: 17
Title: A Social-Behavioral Risk Model Approach to Understanding Cognitive and Language Outcomes of Pediatric Hearing Loss
Authors:
Rachael F. Holt, PhD 1, David B. Pisoni, Ph.D. 2, William G. Kronenberger, Ph.D. 3, Irina Castellanos, Ph.D. 4, Shirley Henning, M.S. 5; 1Speech and Hearing Science, Ohio State Univ., Columbus, OH, 2DeVault Otologic Research Laboratory, Department of Otolaryngology, Indiana Univ. Sch. of Med., Indianapolis, IN, 3Department of Psychiatry, Indiana Univ. Sch. of Med., Indianapolis, IN, 4Department of Otolaryngology, Ohio State Univ., Columbus, OH, 5De Vault Otologic Research Laboratory, Department of Otolaryngology, Indiana Univ. Sch. of Med., Indianapolis, IN.
Abstract:
Introduction: Even after accounting for known audiological, demographic, medical, and device-related risk and protective factors, enormous unexplained individual variability is observed in speech, language, cognitive, academic, and psychosocial outcomes of children with hearing loss who use cochlear implants (CIs) or hearing aids (HAs). Understanding the development of children with hearing loss is limited in part because of the lack of models of child development after hearing loss that incorporate the widely-held view that human development is shaped by dynamic interactions between biology and environment. Increased knowledge of the role of environmental factors and experience-dependent learning offers the potential for significant, novel progress in explaining, predicting, and enhancing outcomes in this clinical population. We propose a new framework for examining mechanisms of action in which research questions are placed in the context of the development of the whole child embedded in a complex dynamically changing learning environment. We examine the family system because it is the most proximal and potent of the environmental and learning influences on young children's development. Our Social-Behavioral Risk Model of development for children with pediatric hearing loss elucidates mechanisms of family influence involved in the adjustment to risk in this clinical population. In the current study, we apply the Social-Behavioral Risk Model to investigate relations between parents' self-reported executive functioning (EF) and the presence of family environment factors encouraging the development of EF skills in children with hearing loss.
Methods: In the current project, we measure hearing-related, biopsychosocial, and family stress risks, family-related mediators and moderators, and at-risk spoken language and EF outcomes in a longitudinal study of 200 3- to 8-year-old oral children (~70 each with cochlear implant, hearing aids, normal hearing) and their families. Results are reported from preliminary year-1 data from the Family Characteristic Scale (FCS; questionnaire measure of family-level EF) and the Behavior Rating Inventory of Executive Function (child and parent EF).
Results: Results revealed that families with more ability to focus on and complete tasks had children with better working memory ($p<.05$). Additionally, families that reported better time management had children with better working memory and inhibition ($p<.05$). All dimensions of the FCS were related to at least one subscale of the parent BRIEF, suggesting that parent EF contributes a significant amount of variance to the overall variability in family EF.
Conclusion: Our results are consistent with a Social-Behavioral Risk Model in showing links between parent, child, and family EF, which influences the development of EF in children with hearing loss. Conceptualized in this manner, developmental outcomes reflect functioning of the whole system including family dynamics.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-2: Parental Role in Child Outcomes
Abstract ID: 196
Title: Motivational Interviewing: An Approach to Improve Parental Engagement
Authors:
Ivette Cejas, PhDOtolaryngology, Univ. of Miami, Miami, FL.
Abstract:
Introduction: Studies have highlighted the critical role parents play in the rehabilitation of children using cochlear implants; however, little is known about the specific strategies that may be used to increase parental involvement and engagement. Motivational interviewing (MI) is a patient-centered intervention that attempts to understand expectations, beliefs, perspectives, and concerns about changing health behaviors. From early work in addictive behaviors, it has been applied to many different areas, such as diabetes, weight loss, and cystic fibrosis (Borrelli et al., 2015). Counseling techniques are only used when the family is ready and willing to hear the information, and is provided in a collaborative, autonomy-promoting manner. Research has shown that simple motivation-enhancing interventions are effective for encouraging people to return for further consultation, return to treatment following a missed appointment, staying involved in treatment, and being more adherent. A recent study showed that despite differences in MI treatment intensity, short interventions were as effective as longer interventions; two MI sessions for as little as 15 min were effective in enhancing treatment attendance (Lawrence et al., 2017). Thus, MI has the potential to improve parent and family participation across clinical and educational settings for the cochlear implant population.
Methods: This presentation will provide an overview of MI, including a brief summary of the evidence base, a guide to the main strategies and principles, and ways in which it may be applied to families of children with hearing loss.
Results: Motivational interviewing is founded on 4 basic principles: Express empathy, Develop discrepancy, Roll with resistance, and Support self-efficacy. Strategies that have been shown to be effective in early stages of change will also be reviewed, such as asking open-ended questions, how to listen reflectively, summarize, affirm, and elicit self-motivational statements. This presentation will provide attendees with resources to obtain further training in motivational interviewing, if interested.
Conclusion: Motivational interviewing is a useful tool for hearing health providers (audiologists, educators, speech therapists) to increase parental involvement across settings, improve intervention adherence and motivate patients to seek further assistance, if needed. Involving the parent in the intervention has great potential to impact cochlear implant outcomes, as well as the entire family system.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-2: Parental Role in Child Outcomes
Abstract ID: 210
Title: Now You're Talking! Coaching and Tracking Parent Engagement Using LENA Technology
Authors:
Kayley Mayer, MAT, TODMountain Lakes EIP/Sound Start Babies, Mountain Lakes, NJ.
Abstract:
Introduction: Current research supports the vast effects of a child's language environment on the development of neural pathways in the brain. An atmosphere rich in adult language models is even more critical for children with hearing loss, namely children who are candidates for and receive cochlear implants. As practitioners in the many disciplines involved in audiology and deaf education and intervention, professionals guide parents and caregivers with strategies to optimize their child's language acquisition. This can be a challenging task, hindered by short or infrequent visits with the child and family. Innovations in technology allow for home environment monitoring in ways that were not previously possible. LENA (Language ENvironment Analysis) gathers information using a small recording device. The device can hold multiple days of data and once processed, provides quantitative statistics on adult word count, turn taking, child vocalization count and auditory environment. Users can also gain information about a child's phonemic repertoire. Developmental snapshots allow for parent reporting of skills to track progress as well as reading minutes per day. In an effort to educate parents and track progress pre- and post-implantation, the COMPASS Project, a family coaching model using LENA technology, was created.
Methods: Participants in the COMPASS Project include parents and caregivers of children with varying degrees of hearing loss and technology use. Families varied in their socio-economic status, ethnicity, and familial make-up. Handouts were created using research-based listening and spoken language strategies for children with hearing loss to address the various LENA measures. A baseline recording consisting of three days was taken and processed. Families of cochlear implant candidates were encouraged to take a baseline pre-implantation. Based on baseline results, practitioners modeled a chosen strategy and families were given practice within therapy sessions, with live coaching and feedback to maximize the efficacy of the strategy. Families then implemented the strategy at home throughout daily routines over a period of time. When mastery of a strategy was achieved, a second language sample was recorded to gauge changes in the LENA measures.
Results: At the time of submission, of the 21 participating families, 61% increased adult word count, 81% increased turn taking count, and 76% increased child vocalizations from baseline to latest recording. Case study data will be presented on CI success as well as updates in project data.
Conclusion: Outcomes indicate that the use of LENA technology paired with coaching approaches and strategies outlined in the COMPASS project provide effective means of intervention for children with hearing loss. The session will highlight benefits of use with CI candidates and recipients, as well as trends and factors which affect the data. Challenges faced in coaching families will be addressed along with ways in which the LENA technology helps in overcoming these challenges.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-2: Parental Role in Child Outcomes
Abstract ID: 221
Title: Maximizing Caregiver Engagement in Spanish-Speaking Families: Providing Culturally and Linguistically Relevant Auditory-Verbal Therapy
Authors:
Sarah E. Radlinski, MS, LSLS Cert. AVTAuditory-Verbal Ctr., Inc., Atlanta, GA.
Abstract:
Introduction: Increasing research evidence indicates that children with hearing loss can learn multiple spoken languages. Moreover, learning the language of the home does not impede acquisition of the majority language but rather, can accelerate it (Bunta & Douglas, 2013). Encouraging development of the home language also facilitates family involvement and maintains the family-child bond. Caregivers play an essential role in the (re)habilitation of children with cochlear implants. Especially for very young children with implants, caregivers are largely responsible for the growth and development of a child's auditory, speech, and language skills. With a rising number of children with hearing loss in the US being identified from Spanish-speaking homes (Gallaudet Research Institute, 2011), there is an ever increasing need to provide effective intervention that maximizes the engagement of Spanish-speaking caregivers to facilitate optimal carryover in the home.
Methods: This presentation is a compilation of information, resources, and conclusions gleaned from the experiences of a bilingual Auditory-Verbal Therapist who has worked with families from over 10 different Spanish-speaking countries.
Results: It is vital for clinicians to recognize differences in Spanish versus English language development, including variations in word usage that are regional/dialect dependent. Resources on speech and language milestones cannot be simply translated from English into Spanish as syntax, morphology, and speech sounds differ significantly between the two languages. Clinicians working with Spanish-speaking children need to be able to cite differences between Spanish and English and know how to access appropriate resources to track Spanish speech and language development. Furthermore, intervention is most effective when the goals and therapy activities are natural and authentic for families. It is critical to target culturally and linguistically relevant themes and holidays, as well as songs, books, vocabulary, and sound-object associations. These factors are all necessary considerations as a part of a comprehensive bilingual therapy program for children with cochlear implants from Spanish-speaking homes.
Conclusion: A rising number of children with hearing loss in the US are being identified from Spanish-speaking homes, resulting in an ever increasing need to provide effective intervention in Spanish. It is necessary that clinicians further develop their knowledge regarding how to provide intervention to children with hearing loss who speak Spanish and how to adjust goals, activities, and resources to be culturally and linguistically relevant for families.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-2: Parental Role in Child Outcomes
Abstract ID: 237
Title: Facilitating Family Engagement in Joint Book Reading and Storytelling in Hispanic Families: Bridging Cultural Differences to Maximize Early Language and Literacy Development in Young Children with Cochlear Implants

Authors:
Sarah E. Radlinski, MS, LSLS Cert. AVT 1, Myriam De La Asuncion, Au.D, CCC-A 2; 1Auditory-Verbal Ctr., Inc., Atlanta, GA, 2MED-EL Corp., Durham, NC.

Abstract:
Introduction: It is well established that joint storybook reading is beneficial for the development of language, listening, speech, social, and pre-literacy skills. Children learn to read by being read to and the pre-literacy process begins in early childhood. Caregivers play an essential role in the (re)habilitation of children with cochlear implants. In the Hispanic culture, reading is typically not integrated in a child's daily routine. Parents generally were not read to as children and therefore, find it difficult to learn and integrate this new skill into their existing culture. It is vital to value the culture and traditions the family does have while encouraging adaption of the practice of reading since the benefits are so multifarious. With a rising number of Hispanic children with hearing loss in the US, there is an ever-increasing need to provide effective intervention that maximizes the engagement of Spanish-speaking caregivers to facilitate optimal carryover in the home.
Methods: This presentation is a compilation of information, resources, and conclusions gleaned from the experiences of a Hispanic audiologist and a bilingual Auditory-Verbal Therapist. Both have experience working with families of children with cochlear implants from numerous Latino countries. Intervention is most effective when goals and activities are authentic for families. For many Hispanic families, reading books to their young children doesn't come as naturally as it does with other cultures, but this cultural gap can be bridged. It is vital to recognize this difference in a sensitive manner and openly discuss the family's past experiences with reading.
Results: To promote daily shared reading, it is important to make benefits explicitly known and plan jointly with families. It is of utmost importance that families be encouraged to read in their home language. It is also critical to target culturally and linguistically relevant stories and books. Encouraging development of the home language facilitates involvement and maintains the family-child bond. This can, however, be challenging due to the very limited number of toddler/preschooler books available written originally in Spanish. Families and clinicians often rely on translations. Many times, families don't have books in their native language at home so it is essential to have other strategies for facilitating storytelling, such as using experience books and "reading the pictures" for picture books or books in non-Spanish print. Regardless of which type of books families are using, it is critical that families be taught ways to maximize the linguistic input. Creating specific Hispanic support groups is also beneficial as families often identify with other Hispanic families on their unique needs, challenges, and strategies that can be incorporated into their culture.
Conclusion: There are a rising number of children with hearing loss in the US that are integrated in the Hispanic culture, resulting in a need to provide effective intervention that is culturally sensitive. The benefits of reading to children with cochlear implants are well established, but there is often a mismatch between clinicians and Hispanic families regarding this topic. Nevertheless, clinicians can develop their knowledge regarding facilitating shared reading that is culturally and linguistically relevant for families. These factors are necessary considerations when implementing effective intervention for Hispanic children with cochlear implants.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-3: Hearing Preservation
Abstract ID: 362
Title: Changes in Middle Ear Mechanics Following Cochlear Implant Surgery
Authors:
Scott Shapiro, MD, Adam Cassis, MD, Levi Stevens, MD, Brian Kellermeyer, MD, Aniket Saoji, PhD, CCC-A;Otolaryngology - Head and Neck Surgery, West Virginia Univ., Morgantown, WV.
Abstract:
Introduction: Changes in middle ear mechanics may explain (1) the presence of air-bone gap following cochlear implant surgery and (2) the poor incidence of successful electrical stapedius reflex measurements in the implanted ear.
Methods: Pre-operative and serial post-operative wide band tympanometry (WBT) measurements were performed to determine (1) changes in middle ear resonant frequency and (2) energy absorbance at tympanometric peak pressure in patients who underwent cochlear implantation. WBT measurements were performed in both the implanted and the unimplanted ear.
Results: WBT measurements show significant changes in middle ear resonant frequency and energy absorption pattern as a function of frequency in the implanted ear which may be attributed to presence of the implant lead in the middle ear and/or the cochlear implant surgery.
Conclusion: The results from the present study show significant changes in middle ear mechanics due to cochlear implant surgery which may be of significance for hearing preservation and electrical stapedius reflex measurements.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-3: Hearing Preservation
Abstract ID: 136
Title: Hearing Preservation and Speech Outcomes in Pediatric Recipients of Cochlear Implants
Authors:
Kevin D. Brown, MD, PhD, Morgan Selleck, MD, Lisa R. Park, AuD, Holly F. Teagle, AuD, Erika A. Gagnon, AuD, Jennifer S. Woodard, AuD;Otolaryngology - Head and Neck Surgery, Univ. of North Carolina Sch. of Med., Chapel Hill, NC.
Abstract:
Hearing Preservation and Speech Outcomes in Pediatric Recipients of Cochlear Implants**Introduction:** The benefits of electric and acoustic stimulation of the cochlea in adult recipients of cochlear implants have been well demonstrated. Limited data is available in pediatric patients. We wished to determine the rates of preservation in pediatric patients and the benefit of combined electric and acoustic processing for speech outcomes.
Methods: One hundred and three pediatric cochlear implant candidates underwent cochlear implantation with a minimum low frequency PTA (LFPTA – 125, 250, 500) of 65 dB or better. Preservation was strictly defined as LFPTA ≤75dB at a minimum of 6 months following implantation. Multivariate analysis was used to determine the effect of electrode type, depth of insertion, and nature of hearing loss (stable or progressive) preservation. Patients were also tested for word recognition pre-operatively and post-operatively in CI and CI + acoustic conditions.
Results: Hearing preservation rates were variable with a strong effect of electrode type and nature of hearing loss on rate of preservation. Modern lateral wall electrodes permit preservation rates of 87-100% in cases of stable hearing loss. There was a large benefit of electric + acoustic listening over electric alone. CNC word scores at 6 months were 54% ± 27% in CI + acoustic conditions versus 35% ± 25% in CI alone conditions.
Conclusion: Low frequency hearing preservation is possible in a majority of pediatric implant recipients. Benefits of electric and acoustic hearing are similar to benefits seen in adult patients.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-3: Hearing Preservation
Abstract ID: 139
Title: The Influence of Electrode Array Length on Hearing Preservation Cochlear Implant Outcomes
Authors:
Brendan P. O'Connell, MD, Andrea Bucker, AuD, English R. King, Aud, Meredith A. Rooth, AuD, Margaret T. Dillon, AuD, Kevin D. Brown, MD PhD, Harold C. Pillsbury, MD;Univ. of North Carolina, Chapel Hill, NC.
Abstract:
Introduction: As indications for cochlear implantation have expanded to include patients with greater degrees of residual hearing, greater emphasis has been placed on minimizing trauma to the apical region of the cochlea. While shorter electrodes are generally associated with higher rates of hearing preservation at short-term follow-up, the long-term implications of electrode length on hearing preservation outcomes are less clear. The objective of this study was to investigate short- and longer-term hearing preservation outcomes using straight electrode arrays of various lengths.
Methods: Adults meeting conventional cochlear implant criteria with residual hearing at the time of pre-operative evaluate were considered for inclusion. Residual hearing was defined as an unaided air-conduction threshold ≤ 80 dB HL at 250 Hz. Low-frequency pure-tone average (LFPTA) was calculated using the average of unaided air-conduction thresholds at 250, 500, and 1000 Hz. Unaided thresholds in the implanted ear were assessed at the preoperative, 1-, 6-, and 12- month post-initial activation intervals. Subjects were divided into groups based on their specific electrode array. All subjects received a full insertion of their device, and were programmed using behavioral mapping procedures. The primary outcome measure of interest was LFPTA shift.
Results:83 patients were included in the analysis (FLEX24, n=17; FLEX28, n=14; Standard, n=52). Mean pre-operative LFPTA was lower for FLEX24 (57 dB) and FLEX28 (60 dB) when compared to Standard (72 dB) electrode arrays ($p<0.0001$ and $p=0.005$, respectively); no difference between FLEX24 and FLEX28 arrays was present ($p=0.42$). At 6-months, ANOVA demonstrated an overall effect ($p=0.04$) for electrode length, although no significant differences in mean LFPTA shift were noted on post-hoc testing when comparing FLEX24 (25 dB), FLEX28 (27 dB), and Standard electrodes (37 dB)($p>0.05$ for all comparisons). At 12 months post-activation, electrode length again had a significant impact on LFPTA shift with ANOVA ($p=0.007$). Post-hoc testing revealed lower mean LFPTA shift for FLEX24 (25 dB) when compared to Standard electrodes (38 dB)($p=0.007$). The long-term LFPTA shift for FLEX28 arrays (30 dB) did not differ from either FLEX24 or Standard ($p=0.75$ and $p=0.45$, respectively).
Conclusion: Hearing preservation can be achieved with electrode arrays offering different insertion depths. Data collection is ongoing to determine whether use of shorter electrode arrays offers better long-term hearing preservation.Learner Outcomes:1. At the conclusion of this poster session, readers will be able to summarize long-term hearing preservation outcomes between electrode arrays offering various insertion depths.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-3: Hearing Preservation
Abstract ID: 220
Title: Intracochlear Shearing Force during Electrode Insertion
Authors:
Ingo Todt, MD 1, Lars Uwe Scholtz, MD 1, Stefan Müller, MD 1, Philipp Mittmann, MD 2, Holger Sudhoff, Professor 1; 1Klinikum Bielefeld, Bielefeld, Germany, 2Unfallkrankenhaus Berlin, Berlin, Germany.
Abstract:
Introduction: Electrode insertion into the cochlea lead to significant pressure changes inside the cochlea with assumed effects on the functionality of the cochlea in terms of residual hearing. Fluid dynamics underline the importance of pressure changes close to inserted things. The aim of the study was to observe the occurence of pressure changes during electrode insertion close to the cochlea implant electrode indicating shearing forces.
Methods: The experiments were performed in different artificial cochlear models. A micro fibre pressure sensor was attached to a cochlear implant electrode at three different positions of the electrode and inserted at different speeds.
Results: We observed significant effects on pressure changes in terms of position, speed and electrode design.
Conclusion: In our model experiments intracochlear pressure changes indicating shearing force during cochlear implant electrode insertion are influenced by position and speed and are electrode design dependent.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-3: Hearing Preservation
Abstract ID: 236
Title: Improving Cochlear Implant Surgery & Paediatric Fitting using ECochG
Authors:
Thomas Lenarz, MD, PhD, Rolf Salcher, MD PhD, Sabine Haumann, PhD, Andreas Buechner, PhD;ENT, Med. Univ. of Hannover, Hannover, Germany.
Abstract:
Introduction: When inserting a cochlear implant (CI) electrode array the surgeon is quite blind as to what is happening inside the cochlea. Hearing and structure preservation, particularly important in paediatric cases, may be enhanced through real-time feedback from ElectroCochleography (ECochG), elicited by acoustic stimulation while the electrode array is being inserted. Such feedback allows the surgeon to adjust, or individualize the insertion, may lead to improved surgical technique and reduce cochlear trauma. Additionally, ECochG can predict hearing levels, allowing the fitting of electro-acoustic stimulation (EAS) in paediatric cases. In this study, ECochG was recorded via the CI system using the most apical intra-cochlear electrode contact.
Methods: A group of 24 participants were implanted with the goal of minimizing cochlear trauma during implantation. All participants had at least one pre-operative threshold estimated at better than 80 dBHL. During insertion of the electrode array, recordings were made for 50 ms bursts of a 500 Hz acoustic stimulus. Typically 20 averages were used for each individual measurement. Subtraction of recordings, time-locked to phase reversed acoustic tone-burst stimuli, allowed extraction of the cochlear microphonic (CM) signal. Insertion of the electrode array continued while the CM was either stable or increasing. As soon as the CM signal dropped and could not be recovered through withdrawing or changing the angle of insertion, then insertion was halted. Following insertion, recordings were made, where possible, for 125, 250 and 500 Hz tone bursts. Comparisons were made between an extrapolated CM threshold and behaviourally estimated hearing thresholds. Analysis was also made of CM amplitude during insertion of the electrode array and correlated with the surgical report.
Results: ECochG recording was possible in all cases. The average electrode array insertion took approximately 25 seconds. The CM was updated rapidly enough to give useful real-time surgical feedback. In 18 cases insertion was halted on the basis of CM amplitude. A significant correlation ($p<0.05$) was found between ECochG and behavioural estimates of low-frequency hearing threshold. Changes in CM amplitude during electrode array insertion were very largely in line with surgical feedback and surgical video review. Correlations between ECochG and post-implant outcome are currently being accumulated.
Conclusion: It appears practical to record ECochG both intra- and post-operatively using the standard cochlear implant hardware. Recording speed is sufficient to provide surgical feedback that allows the surgeon to make changes, e.g. individualizing insertion depth, during electrode array insertion. A significant correlation exists between CM predicted and behavioural estimates of low-frequency hearing thresholds. Future ECochG research should focus on evaluating the longer term benefits of hearing and structure preservation surgery and of EAS applied to paediatric cases.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-3: Hearing Preservation
Abstract ID: 269
Title: Structure Preservation in Cochlear Implantation Assisted by Intra-Operative Implant-Based Electrocochleography and High-Resolution Fluoroscopy
Authors:
Torquil M. Sørensen, PhD 1, Ralf Greisiger, PhD 1, Hilde Korslund, BSc 2, Per K. Hol, PhD 2, Greg E. Jablonski, PhD 1; 1ENT, Oslo Univ. Hosp., Oslo, Norway, 2Intervention Centre, Oslo Univ. Hosp., Oslo, Norway.
Abstract:
Introduction: In CI surgery, electrocochleography (ECochG) and high-resolution fluoroscopy can provide valuable information during electrode insertion. The ear is stimulated acoustically while the resulting cochlear microphonic from the hair cells is measured by the electrode tip at different insertion stages. This provides information about the function of the cochlea which can be used for real-time trauma detection. High-resolution fluoroscopy provides visual information about the electrode movements. This allows us to study the relationship between ECochG and electrode dynamics. Our aim is to investigate whether simultaneous ECochG and fluoroscopy imaging can provide insights that will help to reduce risk of cochlear trauma or other effects of the electrode presence on residual hearing after implantation.
Methods: During deep insertion of a 28 mm electrode in a step-wise manner using a round window approach, we monitor the electrode movements visually using high-resolution fluoroscopy, stimulate the ear acoustically, and measure the resulting cochlear microphonic using implant-based ECochG to monitor cochlear function. After insertion, the cochlear microphonic response from a variety of acoustic stimuli is measured at different recording electrode contacts. Pre-op and post-op pure tone audiograms are studied in light of the per-operative measurement results. The patient group consists of adults which are CI candidates with residual hearing.
Results: Simultaneous ECochG measurements and fluoroscopy video recordings were obtained successfully in all cases. Together they provided valuable insights about possible cochlear trauma during insertion or other effects caused by the presence of the electrode. At the time of abstract submission, four implantations have been included in the study. This is an ongoing study, and all patients investigated until the conference will be included in the presentation.
Conclusion: Preliminary results suggest that implant-based ECochG during insertion is helpful for detection of cochlear trauma or other effects of the electrode presence on the response of the cochlea to acoustic stimuli. High-resolution fluoroscopic imaging helps to identify critical moments during insertion, and to interpret the ECochG results.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-3: Hearing Preservation
Abstract ID: 42
Title: A Study of Complications and Morbidity Profile in Cochlear Implantation: The KAESC Experience
Authors:
Roa Halawani, MD, Abdulrahman Alsanosi, prof. Otolaryngology at King Saud University, Sulaiman Al Ajlan, 6th Year Medical Student King Saud University;Otolaryngology, King Abdullah Ear Specialist Ctr., Al Riyadh, Saudi Arabia.
Abstract:
Cochlear implantation (CI) has been established world wide as a safe and effective method for rehabilitation of profoundly hearing impaired adult or infant, who derives insufficient benefit from amplification. Cochlear implantation is a relatively safe procedure . However, complications can occur associated with the surgical approach or the postoperative care. Since the number of cochlear implantations has increased considerably during the last decade, it is important that both patients and practitioners be aware of the potential complications. Some data are already available concerning surgical and medical complicationsSurgical complications may be classified into major, if they require additional surgery or hospitalization, and in minor, when they resolve in an outpatient ward or even with no treatment at all, as advocated by Cohen et al. (1988). Major complications involve meningitis, flap necrosis, device failure, electrode extrusion, facial nerve paralysis and others; while the minor complications involve facial nerve stimulation, electrode migration, vertigo, tinnitus, and others. MethodRetrospective descriptive study with data collected from 922 operative notes, auditory habilitation registers and medical records of cochlear implantees operated between, January 2006 to June 2017ResultsThe overall complication rate per was 11.4 %, 0.7% being major and 10.7% being minor complications. Complications arose in the first 30 days following surgery in majority of patients, with wound seroma or hematoma being the most common. Excluding device failures, major complication rate was 0.7%. Meningitis was not encountered, and Cholestetoma occurred in one patient ConclusionCochlear implantation continues to be reliable and safe in experienced hands, with a low percentage of severe complications. The patients should have a lifetime follow-up

CI2018 DC Podium and Poster Highlight Abstracts

Session: S1-3: Hearing Preservation
Abstract ID: 194
Title: Robotic Cochlear Implantation: First Clinical Results
Authors:
Wilhelm Wimmer, PhD 1, Stefan Weber, Prof. 2, Juan Anso, PhD 2, Kate Gerber, PhD 2, Nicolas Gerber, Phd 2, Markus Huth, MD 1, Georgios Mantokoudis, MD 1, Martin Kompis, MD PhD 1, Marco Caversaccio, Prof MD 1; 1Department of Otolaryngology, Head and Neck Surgery, Bern Univ. Hosp. (Inselspital), Bern, Switzerland, 2ARTORG Center, Image-Guided Therapy, Univ. of Bern, Bern, Switzerland.
Abstract:
Introduction: Robotic cochlear implantation is a new minimally invasive approach for CI surgery. The procedure is currently evaluated in a clinical trial at the Inselspital in Bern, Switzerland. The aim of this presentation is to report preliminary clinical results of the first cases of robotic cochlear implantation.
Methods: The clinical study was approved by the local IRB and regulatory body. Preoperative assessments included morphological evaluation using CT, taste examination and facial nerve neurography. During surgery, four bone fiducial screws were inserted behind the ear and CT (0.2 mm resolution) was performed to plan a drill trajectory from the mastoid surface, passing through the facial recess to the center of the round window. Access to the middle ear was drilled using a previously developed task specific image-guided robotic system. Sufficient clearance of the drill trajectory from the facial nerve was confirmed using intraoperative cone beam CT imaging. Upon completion of drilling and screw removal, a tympanomeatal flap was created and the round window membrane was exposed. An implant bed was prepared and the electrode array was manually inserted using a specifically manufactured insertion tube. Correct placement and nominal function of the implant was verified by telemetry and postoperative CT imaging. Postoperative facial nerve neurography and taste examination took place two weeks postoperatively. Audiological assessment was performed as part of routine clinical care.
Results: Robotic middle ear access was completed in 5 patients, with successful electrode insertion according to the preoperatively defined plan. Audiological results for all patients are currently being collected.
Conclusion: We have demonstrated in 5 patients that a CI electrode can be successfully inserted into the cochlea through a 1.8 mm keyhole access created by a surgical robot. The workflow with the robotic setup requires additional setup time and extensive teamwork.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-1: Fitting
Abstract ID: 40
Title: The Impact of Flat Panel CT-Guided Place-Pitch Mapping on Speech & Pitch Perception in Cochlear Implant Users
Authors:
Nicole T. Jiam, MD 1, Melanie Gilbert, AuD 1, Patpong Jiradejvong, MS 1, Joshua Stohl, PhD 2, Daniel Cooke, MD 3, Karen Barrett, PhD 1, Meredith Caldwell, BS 4, Charles J. Limb, MD 1; 1Department of Otolaryngology - Head and Neck Surgery, Univ. of California - San Francisco, San Francisco, CA, 2MED-EL Corp., Raleigh, NC, 3Department of Radiology, Univ. of California - San Francisco, San Francisco, CA, 4School of Nursing, Johns Hopkins Univ., Baltimore, MD.
Abstract:
Introduction: Music remains the single most challenging sound for cochlear implant (CI) users, for whom accurate representation of pitch is severely limited. This difficulty with CI-mediated pitch perception may in part be due to the place-pitch mismatch that occurs with intra-operative variability with insertion, anatomical variations between individuals, and a "one-size-fits-all" approach that often occurs with post-implantation programming. Over the past ten years, flat panel computed tomography (FPCT) has emerged as a technology capable of high-spatial resolution volumetric imaging and dynamic imaging. In a prior study, we demonstrated FPCT's superiority, relative to standard multislice CT, in identifying individual electrode channels in vivo. Our findings revealed significant place-pitch mismatch between the clinical maps being used by CI users and the theoretical maps based on post-implantation FPCT findings. To assess whether this place-pitch mismatch may account for poor pitch perception among CI users, we evaluated the impact of using an individualized, image-guided approach towards CI programming on speech and music perception performance.
Methods: We enrolled 17 cochlear implant users who underwent FPCT imaging between June 2016 and May 2017. To create theoretical place-pitch maps for each CI participant, we used secondary reconstructions of the FPCT images, three-dimensional curved planar reformation software, and CI programming parameters. The allotted acclimation period for the place-pitch maps was 30 minutes. Each research subject participated in speech perception tasks (e.g. CNC; BKB-SIN; vowel identification) and a pitch scaling task while using the image-guided place-pitch map (intervention) versus their clinical map with measured thresholds (modified control).
Results: We observed a statistically significant median increase in pitch scaling accuracy when using the image-based map compared to the modified-control map. Specifically, the number of pitch scaling reversals (or errors) for notes spaced at 1.65 semitones or greater decreased when using an image-based approach to CI programming versus the modified control map. While there was no observable median improvement in speech perception while using an image-based map, we found it interesting that large, acute changes in frequency allocation and electrode channel deactivations with the image-guided map did not worsen CNC and BKB-SIN speech perception median performance relative to the clinical map.
Conclusion: These findings suggest that an image-based approach to CI mapping may improve pitch perception outcomes by reducing place-pitch mismatch. Future studies employing a longer acclimation period with chronic stimulation over several months are needed to assess the full range of potential benefits of personalized image-guided CI mapping.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-1: Fitting
Abstract ID: 268
Title: Using EmergingTechnology to Incorporate Accurate and Quick Objective Measurements in aDifficult to Test Pediatric Population.
Authors:
Sarah Coulthurst, MSUCSF Benioff Children's Hosp. Oakland, Oakland, CA.
Abstract:
Introduction: Evaluating, programming and ensuring benefit in a difficult pediatric population brings great challenges to centers serving young children with cochlear implants. With the emergence of new technologies that may better validate and bring quick and easy objective measurements, we could see a streamlining of appointments and more reliable fitting for our patients. Our center has a large and complex pediatric population. We have incorporated the use of eSRT measurements to ascertain suggested map parameters and validated results using speech discrimination scores in comparison to scores previously obtained with behaviorally-derived maps. This is not meant to replace pediatric testing, but to validate and or use in the times when patients will no longer comply during a long appointment.
Methods: To date, results have been obtained for 30 ears. The iMEA software was used to synchronize presentation of electric stimulation and measurement of stapedial reflexes via the Interacoustics Titan middle ear analyzer. A single probe tone frequency (678 Hz) and three electrode stimuli configurations were assessed: stimulation of all active electrodes; stimulation of groups of 4 electrodes (aka, burst stimuli); and single electrode stimulation. Performance with maps utilizing eSRT-suggested M levels were evaluated against behaviorally-derived maps using behavioral observation, patient feedback and age-appropriate speech materials. NRI measurements were compared with M levels for all children.
Results: To date, eSRT thresholds using the iMEA software have been measured in 30 ears. A strong correlation has been observed between the burst stimuli thresholds and the NRI measurements obtained in the fitting software. In addition, the M level thresholds in behavioral maps have high correlation to the suggested eSRT map derived from iMEA. Speech findings and qualitative responses from patients have all been positive.
Conclusion: It is essential that we continue to look at language development and speech access as the gold standard in our children with cochlear implants. However, our pre-lingually implanted children are unable to provide feedback, eSRT findings that are accurate, quick and incorporated will provide ease of fitting during a long appointment. The correlation between speech burst eSRT and NRI bears a strong verification validated by speech findings in an older population of children.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-1: Fitting
Abstract ID: 74
Title: Post-Operative Electrocochleography: A Reliable and Quick Measure to Monitor Residual Hearing and Fit Acoustic Component in Children with Cochlear Implants?
Authors:
Sarah Coulthurst, MSUCSF Benioff Children's Hosp. Oakland, Oakland, CA.
Abstract:
Introduction: Evaluating, programming and ensuring benefit in a difficult pediatric population brings great challenges to centers serving young children with cochlear implants. With the emergence of new technologies that may better validate and bring quick and easy objective measurements, we could see a streamlining of appointments and more reliable fitting for our patients. In cochlear implant patients with preserved residual hearing, intra-cochlear electrode/s from the implant array can be used to measure electro-cochleography (ECoG) thresholds in response to acoustic pure tone stimuli. The cochlear microphonic (CM) portion of the ECoG response has been shown to correlate with pure tone audiometric thresholds in adult cochlear implant recipients with residual hearing. The goal of the present study was to determine (1) if thresholds estimated based on CM ("CM thresholds") can be used to predict pure tone audiometric thresholds in pediatric cochlear implant recipients with preserved residual hearing and, (2) if these thresholds can be used to obtain reliable targets for fitting the acoustic component to the implanted ear.
Methods: To date, twenty-two subjects implanted with the HiFocus Mid-Scala array (25 ears; aged 12 months - 17 years) have participated in this ongoing study. Behavioral pure-tone thresholds for warble tones were measured using insert ear phones over the frequency range from 125 to 2000 Hz. ECoG waveforms were recorded from the most apical electrode of the implant array in response to calibrated acoustic pure tones presented at 75-110 dB HL. CM thresholds were measured. A subset of children with post-operative residual hearing were identified to be fit with an acoustic component in addition to electrical stimulation. These were children who could provide subjective feedback and could be reliably tested with speech measures pre- and post-acoustic fitting and whose parents could reliably troubleshoot and manage the combined device. Age and language appropriate speech measures were used to record outcomes.
Results: To date, CM thresholds and behavioral audiometric thresholds have been measured in 25 ears. A strong correlation has been observed between the CM thresholds and the behavioral audiometric thresholds ($r^2 = 0.72$, $p < 0.01$). The mean difference between the ECoG responses and audiometric thresholds, so far, is -2.6 (±13.0) dB. Eight children, have been fit with an acoustic component to complement their electric hearing and optimally access residual hearing. Fitting software defaults were used for all but one subject, who required modification of the cross-over frequency. Speech scores as well as behavioral feedback indicate benefit when using both acoustic and electric input as compared to electric only. To date, all eight children have continued to utilize the acoustic component chronically.
Conclusion: Our center has a large and complex pediatric population. Our data show that CM thresholds can be used to routinely measure and monitor residual hearing in pediatric cochlear implant patients. Such objective measures are not meant to replace behavioral testing, but to validate and or use when patients no longer comply during a long appointment. A strong correlation between ECoG thresholds and behavioral thresholds obtained post-operatively supports the use of ECoG to provide a quick and reliable method to monitor residual hearing and clinically program electroacoustic settings in this difficult to test and fit population.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-1: Fitting
Abstract ID: 141
Title: Creation of a Single, Universal Performance Measure Using Multiple Imputation in a National Web-Based Cochlear Implant Database
Authors:
Rahul K. Sharma, BS 1, Yutao Liu, MS 2, Jimmy Duong, MS 2, Jedidiah J. Grisel, MD 3, Justin S. Golub, MD, MS 1; 1Department of Otolaryngology—Head and Neck Surgery, Columbia Univ. Coll. of Physicians and Surgeons, New York-Presbyterian/Columbia Univ. Med. Ctr., New York, NY, 2Department of Biostatistics, Columbia Univ. Mailman Sch. of Publ. Health, Columbia Univ. Med. Ctr., New York, NY, 3Head & Neck Surgical Associates, Wichita Falls, TX.
Abstract:
Introduction: Numerous cochlear implant (CI) performance measures exist, making it difficult to aggregate data and study outcomes at a national level. We introduce the technique of multiple imputation to calculate missing CNCw values based on other covariates. This allows a single outcome variable (e.g., CNCw) to be used for further analysis. As a proof-of-concept, we then examine performance with increasing age.
Methods: Prospective, national, web-based CI database (HERMES) drawing from 24 US academic medical centers and private practices. Missing CNCw was calculated using multiple imputation by chained equations (MICE). Variables employed for the imputation included scores of other outcome tests (including BKB-SIN, AzBio) as well as age, sex, duration of hearing loss, and recent use. Linear regression was then performed to assess whether advanced age in adults was associated with CI performance.
Results: A total of 157 adult subjects with 1 year postoperative data were analyzed. MICE was used to estimate missing CNCw values in 17 subjects. In univariable analysis, age was a weak predictor of worse CNCw score ($b = -0.30$; 95% CI = -0.51, -0.09; $p<0.05$). For every 1 year increase in age, CNCw fell on average by 0.3 percentage points. However, when adjusting for potential confounders, including sex, duration of hearing loss, and device usage, age was no longer a significant predictor ($b= -0.33$; 95% CI = -0.96, 0.30; $p>0.05$).
Conclusion: Using multiple imputation, CNCw values were calculated when only AzBio or BKB-SIN were available. This allowed a single, universal performance measure to be used across a broad range of CI centers. This technique has great practical value in the emerging era of big data given the nationwide incompatibility and non-standardization of performance measures. Using this method, we confirmed that older age is a weak-to-insignificant predictor of performance.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-1: Fitting
Abstract ID: 189
Title: Comparison of Speech Perception & Functional Listening Performance according to Inter-implant Intervals in Sequential Bilateral Cochlear Implantations
Authors:
Oak-Sung Choo, MD, Ji-Min Roh, Speech therapist, You-Jeong Kim, Speech therapist, Jeong Hun Jang, MD, PhD, Hun Yi Park, MD, PhD, Yun-Hoon Choung, MD, DDS, PhD;Otolaryngology, Ajou Univ. Sch. of Med., Suwon, Korea, Republic of.
Abstract:
Introduction: Bilateral cochlear implantation (CI) can be received either simultaneously or sequentially. And the majority of children who require bilateral CI usually undergo sequential surgeries. With regard to this population of children, this study aimed to evaluate the influence of a long inter-implant interval between the two CIs in children who received the second CI several years after receiving the first surgery.
Methods: Twenty nine children who used their second implant for more than 12 months were included in this study. They all received bilateral implantation sequentially. The mean interval was 5.83 years (mean of 1st CI age: 3.5years, mean of 2nd CI age: 9.3 years). First, the patients were classified into three groups according to the inter-implant intervals: group I, under 3.9 years (n=7), group II, 4~6.9 years (n=12), and group III, 7~9.9 years (n=10). Comparison of postoperative speech perception (monosyllabic word, bisyllabic word, and sentence) test results at 3, 6, and 12 months after the first and second CI were done among the groups. To evaluate the functional listening performance, Speech, Spatial, and Qualities of hearing scale (SSQ) were measured and compared between the three groups with different inter-implant intervals.
Results: Regarding speech perception, Group 1 with shortest inter-implant intervals showed significant improvement in bisyllabic word test compared to Group 2 and 3 after 3 months of surgery. However, after postoperative 6 months, all of the groups showed similar improvement of speech perception regardless of inter-implant intervals. Also, SSQ results did not differ between any of the groups with different inter-implant intervals of sequential bilateral CIs.
Conclusion: From our study, we were able to acknowledge that when the speech perception performances are good after the 1st CI, the outcomes of the 2nd CIs may also be excellent despite the time interval between the sequential bilateral cochlear implantations. Furthermore, the inter-implant time interval did not alter the improvement of daily life listening abilities in sequential bilateral CIs. Thus, bilateral CI can also be recommended to the children with long history of an unaided ear, despite the long inter-implant interval. Active counseling and habilitation should be provided for these children receiving to encourage their improvements in the second implanted ear.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-2: Speech and Language Development Factors
Abstract ID: 97
Title: Childhood Apraxia of Speech and Hearing Loss: A Comparative Study Exploring the Possibility of Dual-Diagnoses
Authors:
Elizabeth Adams Costa, PhD 1, Nancy Mellon, M.S. 1, Meredith Ouellette, MS 1, Kate Maina, MHS 1, Sharlene Ottley, PhD 1, Christine Mitchell, M.S. 2; 1The River Sch., Washington, DC, 2Bloomberg School of Public Health, Johns Hopkins Univeristy, Baltimore, MD.
Abstract:
Introduction: Childhood Apraxia of Speech (CAS) is a neurological speech motor planning disorder that involves the disordered transition from an abstract phonological code into motor commands (Button et al., 2013). Most children with CAS present with a broad range of language problems, and are likely to present with comorbid reading, spelling, and academic difficulties. (Freebairn et al., 2004). When diagnosing children with CAS, it is recommended that hearing loss be ruled out to ensure that the presentation results from motor planning, and is not a result of hearing loss. The reduced use of motor sequencing movements involved in speech, secondary to auditory deprivation in children with CIs, creates an atypical developmental course (Pisoni et al., 2008). As a result, the differential and/or comorbid diagnosis of apraxia and hearing loss is complicated. The goal of the current study was to compare a group of children with CIs who also have a diagnosis of CAS, to a group of children with CIs who did not have a CAS diagnosis.
Methods: This study examined longitudinal data of 10 children with CIs who were also diagnosed with CAS. An oral motor evaluation and/or performance on the Kaufman Speech Praxis Test for Children (KSPT), determined the CAS diagnosis. Each child in the CI+CAS group was matched with a child who had CIs, but did not have a CAS diagnosis. In order to control for the developmental impact of auditory access, the two groups did not differ on age at implantation, and had access to the same intervention resources. The study compared the CI+CAS group to the CI only group on: expressive language (Clinical Evaluation of Language Fundamentals - CELF), articulation (Goldman-Fristoe Test of Articulation - GFTA), phonological processing (Test of Auditory Processing Skills - TAPS), working memory (Kaufman Assessment Battery for Children - KABC, Sequential Processing Scale), word reading (Wide Range Achievement Test - WRAT, word reading), and spelling (Wide Range Achievement Test, WRAT, spelling).
Results: Significant differences were found on several variables, indicating that the CI+CAS group performed significantly lower on a number of measures. Children in the CI+CAS group demonstrated lower scores on expressive language ($p=.01$), articulation ($p=.045$), phonological processing ($p=.01$), and spelling ($p=.04$). A difference approaching significance was found for scores on working memory, with the CI+CAS group performing lower ($p=.06$).
Conclusion: The results of the study suggest that even when holding age of auditory access constant, there are significant differences across domains for a group of children with CIs that have CAS, compared to a control group of children with CIs who were not diagnosed with CAS. This research supports the possibility of a comorbid and distinct CAS diagnosis for some children with hearing loss. While there is much debate regarding definitive diagnostic markers for CAS that reliably distinguish CAS and non-CAS speech disorders, it is important to examine the identified characteristics that may account for variability in outcomes for children with hearing loss.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-2: Speech and Language Development Factors
Abstract ID: 112
Title: Cognitive Profiles of Children with Cochlear Implants: Results from a Sample of Children in the Context of a Supportive Inclusive Model, Years 2 and 3
Authors:
Elizabeth Adams Costa, PhD 1, Nancy K. Mellon, M.S. 1, Meredith Ouellette, M.S. 1, Sharlene Ottley, Ph.D. 1, Lori A. Day, Ph.D. 2, Colleen Caverly, M.A. 1; 1The River Sch., Washington, DC, 2Gallaudet Univ., Washington, DC.
Abstract:
Introduction: Children with CIs generally demonstrate lower performance on standardized measures of language and working memory compared to hearing peers. There is also variability in the hypothesized direction of causal effects between language and working memory. Some researchers assert that working memory is critical to the development of spoken language, whereas others suggest that performance on working memory tasks is influenced by language experiences. The current presentation will share the cognitive profiles of children with CIs, and discuss preliminary findings over a three-year span.
Methods: This study examined verbal comprehension and working memory performance over a three-year span in children who use cochlear implants and attended an inclusive education program. The measures used were the Wechsler Preschool and Primary Scales of Intelligence, 4 th Edition (WPPSI-IV; ages 2:6-7:7 years) and the Wechsler Intelligence Scale for Children, 5 th Edition (WISC-V; ages 6:0-16:11 years). Participation varied as follows: Time 1, N=19 children (15 WPPSI-IV, 4 WISC-V), Time 2, n=15 children (9 WPPSI-IV, 5 WISC-V), Time 3, n=7 children (1 WPPSI-IV, 6 WISC-V). Standardized scores on the Verbal Comprehension Index (VCI) and Working Memory Index (WMI) were analyzed over time.
Results: Average VCI standard scores improved over time (VCI SS T1=96.21; T2=99.93; T3=106.86). Average WMI standard scores also improved, although to a lesser degree (WMI SS T1=90.74; T2=90.86; T3=92.86). Significant correlations were found between VCI scores across all three years, with large effect sizes ranging from 0.78 to 0.95. WMI scores were significantly correlated only with the results of the preceding year. VCI and WMI scores were significantly correlated with one another in Year 1 (r=0.67) and Year 2 (r=0.50), with decreasing effect sizes, and were not significantly correlated with one another at Year 3 (r=0.31).
Conclusion: In the present study, VCI scores continued to improve over time while WMI scores remained relatively consistent. The correlation strength between VCI and WMI scores decreased. This finding is consistent with previous studies examining children in this setting. In a 2016 cross-sectional longitudinal study children with CIs, had significantly lower VCI and WMI scores on WPPSI compared to hearing controls. However, group performance on WISC-V indicated improved VCI scores, while WMI scores remained significantly lower. In a 2017 study examining the relationship between cognition and language, the correlation between working memory and core language was found in children with language scores below average, but was not observed in children with above average language scores. The results of the current and previous studies indicate that in an educational program that provides specialized supports for spoken language development in young children with hearing loss, language abilities notably improve with age, whereas working memory abilities remain more consistent. Further, the results indicate that when language scores were lower, which was the case in the first year's sampling, there was a stronger correlation between performances on language and working memory tasks; the correlation decreased as language scores improved.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-2: Speech and Language Development Factors
Abstract ID: 148
Title: Long Term Literacy Outcomes: Reading, Writing and Phonological Processing for Adolescents who Received Cochlear Implants Younger than 12 Months
Authors:
Shani J. Dettman, PhD., M.Ed., Speech Pathology 1, Wendy Arnott, PhD, BSPath (Hons); Senior Research Fellow, UQ 2, Robert Cowan, PhD, FAudA(CCP), GAICD 3, Aleisha Davis, MPhil, MSLP 4; 1Dept Audiology and Speech Pathology, The Univ. of Melbourne, Parkville, Australia, 2Hear and Say Ctr., 29 Nathan Ave, Ashgrove, 4060, Australia, 3The HEARing CRC & HearWorks, University of Melbourne, VIC 3010, Australia, 4The Shepherd Ctr., Sydney, Australia.
Abstract:
Introduction: Not bound by FDA guidelines, Australian cochlear implant programs have been well placed to provide access to cochlear implants to infants younger than 12 months and toddlers aged 12 to 24 months since 1998. These children are now adolescents/young adults, and it is timely to assess their functional literacy skills.
Methods: Participants aged 11 to 18 years, who received their first cochlear implant when younger than 12 months, or between 12 months and 24 months were recruited from a range of centres around Australia to complete a comprehensive battery of standardized tests of reading, writing and phonological processing; the Woodcock Reading Mastery Test - 3 rd Edition (WRMT-3), the Comprehensive Test of Phonological Processing (CTOPP) and the spontaneous writing sub-test of the Test of Written Language (TOWL).
Results: The mean (SD) standard scores for the WRMT-3 reading clusters were follows; Basic Skill=98.5 (SD 17.8), Reading Comprehension=111.6 (SD 19.3), Oral Reading Fluency=101.7 (SD 18.1), Total Reading Cluster=105.1 (SD 19.3). The mean (SD) standard scores for the CTOPP composite scores were as follows: Phonological Awareness=102 (SD 19.3), Phonology Memory=97 (SD 15.5), Rapid Naming=92.6 (SD 8.9), Alternative Phonological Awareness=100 (SD 9.5) and Alternative Rapid Naming=87.5 (SD 14.3) where 100 (+ SD 15) is the CTOPP and WRMT-3 mean for the normative group from the general population. The mean (SD) scaled scores for the TOWL were as follows; Contextual Conventions=15 (SD 1.87) and Story Composition=13.6 (SD 1.82) where 10 (+ SD 2) is the normal range. Finally, the TOWL mean (SD) Spontaneous Writing Index was 130.6 (SD 11.1) where 100 (+ SD 15) is the TOWL mean for the normative group from the general population.
Conclusion: Results indicated phonological processing (awareness, memory and rapid naming), reading (basic skills, vocabulary, and comprehension) and spontaneous writing (construction and composition) were within the same range expected for the normative group from the general population. The long-term literacy results demonstrated by these children, now adolescents, support early provision of cochlear implants to optimize early speech perception, language and speech production which provide the essential foundations for subsequent literacy development.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-2: Speech and Language Development Factors
Abstract ID: 232
Title: Professionals' Rates of Auditory Verbal Strategy Utilization
Authors:
Elizabeth Rosenzweig, MS, LSLS Cert. AVT, Elaine Smolen, MAT LSLS Cert. AVEd;Teachers Coll., Columbia Univ., New York, NY.
Abstract:
Introduction: Although auditory verbal (AV) practice is employed by a variety of professionals in all over the world, those who use it vary widely in their preparation and skill in applying evidence-based practices to their work with children who are deaf and hard of hearing. Fickenscher and Gaffney (2016) identified 19 evidence-based strategies used in effective AV practice, including acoustic highlighting, sabotage, motherese, whispering. This study investigated how often these AV strategies are used by professionals who are certified Listening and Spoken Language Specialists (LSLS Cert. AVEd and AVT), those who are currently in the certification process, and those who are not certified.
Methods: Data were collected online through an online survey from February through June 2017, yielding responses from 136 professionals. Participants were presented with a description of each of Fickenscher and Gaffney's (2016) 19 evidence-based strategies. They then indicated whether they use the strategy regularly (defined as at least once during a typical day of therapy/class sessions). Participants also provided demographic and background data, including age, professional designation, years of experience, LSLS certification designation and status (i.e., certified LSLS, in the certification process, or not a LSLS), primary mode of service delivery, and primary communication modality.
Results: Although all 19 evidence-based strategies were reportedly used by a majority of respondents, regardless of LSLS status or professional designation, the frequency of use of varied considerably among strategies and between participant groups. For example, while LSLS-certified professionals and those in the process of earning the credential reported using sabotage at similarly high rates (94.4% and 94.6%, respectively), only 84.4% of those without LSLS certification used this strategy. About 89.1% of LSLS, 81.1% of those in the certification process, and 59.1% of those without LSLS certification reported using whispering. Similar patterns were found across all 19 strategies surveyed. For all strategies, LSLS-certified professionals reported highest rates of utilization, followed by those in the LSLS certification process. Non-certified professionals who had not expressed interest in specialization used these evidence-informed strategies at lower rates than other professionals.
Conclusion: Analysis of survey results indicate significant differences in AV strategy utilization between LSLS certified and noncertified professionals. These data demonstrate continued need for professional development to disseminate information about best practices in rehabilitation for children with cochlear implants, as well as provide strong evidence that families can use to advocate for highly qualified (i.e., LSLS-certified) providers to serve their children, as these professionals practice in ways that are demonstrably different from those of non-certified professionals.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-2: Speech and Language Development Factors
Abstract ID: 270
Title: Literacy Instruction in Children with Hearing Loss: A ProfessionalDevelopment Model for Teachers of the Deaf and Hard of Hearing
Authors:
Debbie Schrader, BS, LSLS Cert. AVT, Dianne Hammes Ganguly, M.S. CCC-SLP, Laurel M. Fisher, Ph.D., Karen Johnson, Ph.D.;USC Caruso Family Center, USC Caruso Family Ctr., Los Angeles, CA.
Abstract:
Introduction: Research on struggling readers highlights the need for teachers to provide explicit instruction, scaffold, model reading behaviors, link reading and writing, and apply principles of balanced literacy. Credentialed teachers of the deaf and hard of hearing (D/HH) have limited opportunities to acquire such evidence-based strategies for supporting early literacy in children with CIs developing spoken language. We describe a program of professional development designed to increase pedagogical knowledge among DHH teachers and other community professionals related to key foundational literacy skills.
Methods: A 5-day (30-hour) program initially was developed for DHH teachers from the community hired to provide small group instruction during an annual summer literacy intervention program for children with hearing loss from Spanish-speaking households. The purpose of the training was to provide information needed to set learning targets and scaffold instruction for oral D/HH children ages 5:0 to 8:11. Core areas of instruction included: development of phonological awareness, building vocabulary and grammatical knowledge through dialogic reading, increasing oral fluency through shared reading, and evidence-based strategies to support early writing. Seventeen professionals participated in the 2017 summer training program, including 4 teachers hired to provide child instruction in the summer intervention and 13 community professionals and administrators, who actively sought out the training and asked to participate. Prior to the training, participants completed a Teacher Survey, developed for the project, in which they rated their pedagogical knowledge and procedural fidelity in teaching reading and writing to oral D/HH students during the period of emergent literacy. Self-ratings were reported on a Likert-type scale, ranging from 1 (“no experience”) to 5 (“expert”). The Teacher Survey was completed again immediately following the training.
Results: Teaching experience among participants ranged from no experience (student teaching only) to more than 10 years. Prior to training, self-ratings of competencies overall were at the “developing” level. Following the training, self-ratings approached the “proficient” level. The improvement in self-ratings from pre- to post- were statistically significant ($p<0.01$; Wilcoxon signed-rank tests) for subsets of items related to both knowledge and procedural fidelity. Since program inception 4 years ago, 45 professionals have attended the 5-day summer teacher training. Collectively, these professionals represent 30 urban school districts and 3 private agencies within 4 counties in our state. Based on average classroom sizes and caseloads, we estimate that more than 750 children have likely been served by professionals who have participated in the teaching training to date.
Conclusion: Community interest in an intensive teacher training program designed to provide the knowledge required to provide effective literacy instruction for DHH children developing spoken language underscores the need for information regarding literacy instruction for this population. This program of professional development has enabled us to partner more effectively with teachers and other service providers within our extended community supporting literacy in children with CIs.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-3: Service Delivery
Abstract ID: 135
Title: Treatment Pathways after Cochlear Implant Evaluation: Analysis of the Formal Evaluation Process
Authors:
Andrew Redmann, MD 1, Kareem Tawfik, MD 1, Rachel Wade, AuD student 1, Kayla Cyphert, AuD student 1, Eric Antonucci, BS 2, Theresa Hammer, AuD 1, Shawn Stevens, MD 3, Lisa Houston, AuD 1, Gavi Kohlberg, MD 1, Ravi Samy, MD 1, Joseph Breen, MD 1; 1Department of Otolaryngology: Head and Neck Surgery, Univ. of Cincinnati, Cincinnati, OH, 2School of Medicine, Univ. of Cincinnati, Cincinnati, OH, 3Department of Otolaryngology: Head and Neck Surgery, AOC Physicians, Phoenix, AZ.
Abstract:
Introduction: Consideration of cochlear implantation typically includes formal evaluation of candidacy by an audiologist. However, to date, no studies have demonstrated what occurs to patients when CI evaluation has been performed, and what percentage of patients undergoing CIE actually undergo CI placement. In addition, the reasons why CI candidates do not undergo implantation are poorly defined.
Methods: We performed a retrospective review of all scheduled CIEs within the Department of Otolaryngology affiliated with a tertiary care academic neurotology practice between January 1 st, 2014 and April 15 th, 2015. The management pathways of patients undergoing CIE were examined.
Results: 114 patients were scheduled for CIE during the study period. 109 patients started the evaluation process, and 102 patients completed evaluation. Of patients that completed CIE, 23 (23%) did not meet audiologic criteria for implantation, whereas 79 (77%) met criteria. 31 patients meeting criteria did not receive implants (28%) while 48 underwent implantation, yielding an overall implant rate of 42% among patients scheduled for CIE. The most common reasons for deferring CI among those deemed candidates were insurance coverage/cost (16%), opting for hearing aids as an alternative treatment (16%), patient health (16%) and patient hesitation (16%). 36 patients received either conventional hearing aids or Bi-CROS hearing aids following their evaluation (33%)
Conclusion: Less than half of patients undergoing CIE at an academic medical center ultimately underwent cochlear implantation. Patients meeting criteria for implantation who do not receive implants forego treatment due to cost, health, or simply choosing to avoid implantation in favor of hearing aids. Further work is necessary to determine what factors are predictive of implantation.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-3: Service Delivery
Abstract ID: 159
Title: Improving Efficiencies and Effectiveness of CI Service Delivery: The Role of Value Stream Mapping
Authors:
Colleen Psarros, MA 1, Craig Stewart, Economist 2, Eleanor McKendrick, Audiology 1, Kylie Chisholm, Speech Pathology 1; 1SCIC, Gladesville, Australia, 2Verto Ltd, Gladesville, Australia.
Abstract:
Introduction: Cochlear implant service delivery models have traditionally followed an evaluation, acute, and ongoing management phase. With the expansion of selection criteria, the number of sessions in the evaluation phase were observed to be increasing, with not all clients converting to cochlear implantation. Further, those who did proceed to cochlear implantation were taking longer to reach the acute phase of their management. The financial implications of this change in criteria as well as traditional cochlear implant referrals was measured to identify ways to improve efficiencies and effectiveness of cochlear implant service delivery.
Methods: A total of 56 intervals of service delivery over a 10 year period was mapped across the journey of adult cochlear implant recipients. A review of the profit and loss of service delivery over this 10 year period based on the cost of services provided was averaged across the number of recipients and clinicians. Intervals of service reviewed included the number of sessions beyond those scheduled in the routine scheduled appointments as per clinical protocols for device programming and evaluations, including troubleshooting sessions with repairs and replacements.
Results: Results indicated that cochlear implant services were not profitable until 5 years post cochlear implantation. All service delivery prior to that point was running at a loss with cumulative loss exceeding $AUD 200,000. Costs did not even out until approximately 9 years following cochlear implantation. Points of significant deficit were identified and strategies put in place to address this deficit.
Conclusion: A value stream mapping procedure can provide vital information for organisational decision making regarding efficacy and efficiencies of models of cochlear implant service delivery. This process provided the clarity required to put measures in place to maximise appointment use and reduce costs. In this instance the main focus was the initial assessment phase of the cochlear implant journey. Preliminary information on the triaging implemented as a result of these findings will be presented. Implications for managing various cohorts of clients will also be discussed.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-3: Service Delivery
Abstract ID: 215
Title: Increasing Clinic Efficiency through Manufacturer Innovation
Authors:
Holly F. B. Teagle, AuDUniversity of North Carolina, Univ. of North Carolina, Durham, NC.
Abstract:
Introduction: As patient numbers increase, clinicians are challenged to find short cuts or additional support to complete non-billable services necessary to conduct the day to day activities of a cochlear implant clinic. For a large pediatric cochlear implant program with nearly 1000 active recipients, registration of equipment, responding to troubleshooting calls and managing equipment exchanges can consume significant time and attention. Manufacturers have implemented valuable time saving systems to relieve clinics from this burden but they are only being used by an estimated 50% of clinics.
Methods: An analysis of the support offered via auto registration by a cochlear implant manufacturer was performed for one large pediatric cochlear implant center to estimate the time and resource savings this service provided over a 3 year period. In this same time frame, we also reviewed the number of service requests that the manufacturer was able to manage with and without clinic support. Estimates of time and cost savings were made based on current service and billing practices.
Results: To date, since the initiation of this service, there have been 368 automatic-registrations of equipment following the initial stimulation of devices. If done manually, the registration process for a new CI recipient typically takes about 15 minutes to complete forms that include demographic information and equipment details. More impressively, during this 3 year period there were 1,752 Service Requests initiated by recipients or caregivers and 1,518 (87%) were acted upon by the manufacturer without clinic assistance. A modest estimation of 15 minutes of clinician time per incident yields a total of about 380 effort hours that were off loaded from the clinic. The implementation of these two services represents a total of 471 hours over a 3 year period, or an average of 157 hours per year, of clinician time and effort.
Conclusion: Innovations developed by CI manufacturers who partner with CI clinics provide a number of benefits. These include faster and more efficient service for CI recipients as well as significant resource saving for clinics. Time saved at the initial stimulation by auto-registration of hardware can be spent on device use and maintenance counseling or habilitation planning. In a large center, service requests managed by the manufacturer instead of clinicians results in significant time saving. For this clinic, these programs translated to approximately 1 month FTE audiologist‘s salary per year and more if one considers the increased capacity to see more potential recipients.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-3: Service Delivery
Abstract ID: 176
Title: The Evolution of Telepractice as a Model of Clinical Service Delivery: A Longitudinal Perspective
Authors:
Colleen Psarros, MA 1, Gregory Leigh, Education 2, Catherine McMahon, Audiology 3, Robert Cowan, Audiology 4; 1SCIC, Gladesville, Australia, 2RIDBC, North Rocks, Australia, 3Macquarie Univ., North Ryde, Australia, 4Hearing CRC, Melbourne, Australia.
Abstract:
Introduction: Longitudinal use of telepractice for the past 10 years at RIDBC has been underpinned by the evolution of technology and ongoing experiences with paediatric and adult clients across a range of environments. The underlying principles identified as being crucial for the longevity of telepractice as a model of service delivery such as ongoing evaluation of stakeholders, efficiency and effectiveness of the service delivered will be outlined in this paper. Further, we will highlight the innovations that have made the longevity of the telepractice model possible with particular focus on an APP that has been designed and verified for use in measuring speech discrimination in synchronous and asynchronous situation enabling self efficacy of clients with ongoing evaluation and monitoring of performance.
Methods: A model to evaluate effectiveness and efficiencies of telepractice in clinical service delivery was used to evaluate an APP for evaluation of speech discrimination. A group of normal hearing and hearing impaired subjects using a range of devices were evaluated with the APP using synchronous and asynchronous procedures and results compared to those obtained in a gold standard listening conditions. Test materials included CNC words and BKB like sentences using an adaptive noise conditions or fixed signal to noise ratios as determined by the Telscreen 1 testing procedure.
Results: Effectiveness of speech discrimination measures were not impacted by the service model - through telepractice or in a traditional clinical setting. This is consistent with longitudinal findings from the implementation of telepractice in other aspects of cochlear implant management including counselling, device mapping, and rehabilitation. Clinical outcomes and the quality of outcomes were not impacted by the service model. Efficiencies in timeliness of service and reductions in travel time were reported. Satisfaction ratings revealed that most of the clients felt more integrated into their device management and reported a deeper understanding of their technology and the processes involved.
Conclusion: Longitudinal implementation of telepractice model must readily adapt to new technologies and the evolving landscape within the field of cochlear implantation. Evidence is required to ensure that any changes to the model are efficient and effective. Telepractice models will continue to evolve for all aspects of management for cochlear implantation and can provide a service delivery model that can benefit a range of clients. Dillon H, Beach E, Seymour J, Carter L & Golding M(2016): Development of Telscreen: a telephone-based speech-in-noise hearing screening test with a novel masking noise and scoring procedure, International Journal of Audiology, DOI: 10.3109/14992027.2016.1172268

CI2018 DC Podium and Poster Highlight Abstracts

Session: S2-3: Service Delivery
Abstract ID: 260
Title: Removing Barriers to Cochlear Implantation in a Large Academic Medical Center
Authors:
Sarah Sydlowski, AuD, PhD, Erika Woodson, MD, Katie Hahn, AuD, Karen Petter, AuD;Hearing Impant Program, Cleveland Clinic, Cleveland, OH.
Abstract:
Introduction: Cochlear implant (CI) candidacy guidelines and CI team practice patterns have changed in recent years such that individuals who were not previously considered to be candidates are now routinely evaluated and implanted. As a result, we would anticipate increased CI volumes; yet internally, our annual implant volume had plateaued and similar trends have been observed nationally. Our implant team participated in a 12 week continuous improvement curriculum wherein we quantified the problem of inconsistent referral patterns, developed a countermeasure, and implemented tactics and education to reverse the trend among internal providers. The goals of this project were to (1) increase the percentage of patients who have completed a hearing evaluation in our department who are appropriately referred for a cochlear implant evaluation; (2) increase percentage of cochlear implant evaluations received from internal referrals versus external or self-referrals; and (3) increase overall number of new cochlear implant recipients using a data-driven and methodological approach.
Methods: Quantifying the problem: Assessed referral source confidence with discussing CI candidacy criteria via departmental survey. Reviewed 3,086 audiograms over three month period and identified 150 candidates for cochlear implant evaluation. Reviewed charts to determine whether a CI evaluation had been recommended. Determined that 45% of straightforward (meeting FDA or Medicare criteria) and 15% of subtle (off-label) candidates were referred for CI evaluation. Developing and implementing countermeasure: Developed a CI candidacy tool for internal use among departmental referral sources and conducted education sessions for all providers. After department-wide implementation, re-assessed provider confidence and accuracy of appropriate referrals.
Results: Reversed referral source confidence in discussing CI candidacy with patients from 85% somewhat confident or less to 85% somewhat confident or more; increased percentage of appropriate referrals for CI evaluation, increased internal referrals for cochlear implant evaluation from 30% to 84% over the first six months of candidacy tool implementation, and increased overall CI candidates from internal referral sources for the year.
Conclusion: Development and implementation of the candidacy tool reduced the need for non-specialists to retain specialty knowledge related to CI candidacy while allowing for confident identification of candidates for evaluation and subsequently increasing consistency of patient care throughout the Institute.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-1: Language Development in Children
Abstract ID: 129
Title: Strategies for Improving Communication Intervention for Minority Language-Speaking Families of Preschool Children with Hearing Loss: Insights Derived from Automated Digital Recordings, Qualitative Interviews, and Questionnaires
Authors:
Alice A. Eriks-Brophy, PhDSLP, Univ. of Toronto, Toronto, Canada.
Abstract:
Introduction: Early intervention for preschool children with hearing loss (PCWHL) relies on caregivers as the primary language models to stimulate the child's communication development. As more and more families from minority language and cultural backgrounds are enrolling in early oral language intervention programs for their PCWHL, it is important for clinicians to understand and respect the communicative behaviors, values, and beliefs about language and disability held by these families in order to provide them appropriate services and to enhance caregiver involvement in and satisfaction with services received.
Methods: This study used data collected from the Language ENvironment Analysis System (LENA) along with qualitative interviews and Likert scale questionnaires to examine caregiver-child interaction patterns, language socialization practices, beliefs about childhood hearing loss, and caregiver satisfaction with auditory-oral language intervention services received for their PCWHL. Participants were 15 families representing minority cultural backgrounds who spoke non-Western languages with their PCWHL in the home and who were receiving auditory oral language intervention services in English at various sites in the Greater Toronto Area, along with 5 English-speaking families. Minority languages spoken by the participating families were Mandarin (5 families), Tamil (2) Tagalog (2) Urdu (1), Bengali (1), Tibetan (1), Malayalam (1), Dari (1) and Vietnamese (1). The PCWHL ranged in age from 8 to 48 months. Fourteen children were males and 6 were females. None of the children had additional conditions that might affect their communication development. Degree of hearing loss ranged from moderate to profound. Thirteen of the children wore hearing aids, 5 wore bilateral CIs, and 2 wore one CI and one hearing aid.
Results: Summary LENA results showed differences in Conversational Turn Count, Adult Vocalizations, and Child Vocalizations in the communication environments of minority language versus English language speaking PCWHL, with some subtle differences among individual minority language groupings. Based on in-depth analyses of the qualitative interviews and questionnaires, it is argued that these differences are best interpreted as reflecting the influence of caregivers' culture on beliefs about language socialization, the roles of children as communicators, and understandings of childhood hearing loss rather than as representing deficits in the communication environments created by caregivers input, interactions, and language stimulation.
Conclusion: An understanding of the ways in which cultural beliefs and practices might affect communication development, family involvement, caregiver satisfaction, and overall quality of life in families of PCWHL from minority language and cultural backgrounds is an essential component in the development of cultural sensitivity and in the provision of appropriate supports, suggestions, and services to these families.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-1: Language Development in Children
Abstract ID: 198
Title: Cultural Sensitivity: The Need for Integrating Hispanic Cultural Differences in Practice Management and Understanding its Effects on Parent Engagement and Cochlear Implant Outcomes
Authors:
Myriam De La Asuncion, AuD, Annie Rodriguez, Doctorate in Audiology;MED-EL, Durham, NC.
Abstract:
Introduction: Hispanics are currently the largest cultural minority group in the United States. According to the NIDCD, nearly 1 out of every 7 Hispanic currently has hearing loss. The total general number of Hispanics is expected to increase dramatically. As the general Hispanic population increases, so will the Hispanic population with hearing loss and deafness. This poses an immense need in learning and understanding the Hispanic culture and the unique needs of this population particularly those whose first language is Spanish. It will be imperative to demonstrate cultural sensitivity but even more critical to become culturally competent.
Methods: This "cultural sensitivity" perspective changes the way we approach, counsel, support, and provide services to our Hispanic families. Although it is important to provide clinical care and deliver services in their native language, it is even more important to capture the culture which may differ greatly from region to region. Discussing these differences within the Hispanic culture will provide professionals with great insight in regards to their own beliefs, traditions, perspectives, and ultimately decision making processes. It can greatly influence your delivery of optimal care and create an environment for great success for the child with a cochlear implant and their family.
Results: Given the anticipated rise of the Hispanic population in the upcoming years and the limited amount of Spanish speaking professionals, hearing professionals will need to develop the proper skills to be able to manage this population effectively. These skills include cultural awareness, closing the cultural gap, appropriate counseling and overall improved clinical management. Professionals who are able to develop such skills can then provide more realistic recommendations that will empower families in making decisions and improving compliance without omitting a part of their own culture. Striving for cultural competence also allows hearing professionals to develop awareness about their own cultural beliefs and clinical practices. In addition, it enables them to better understand their own culture and how it can greatly affect behavior/views, the way we communicate, parent, and even educate.
Conclusion: Overall, it is evident that the fastest growing minority group in the US is Spanish speaking (Ramirez & de la Cruz, 2003). Data from the American Speech and Hearing Association (ASHA) indicate that approximately 95% of members are Caucasian Americans. Within special education, 86% are Caucasian American, 1% African American, and 4% Hispanic American (Boyer & Mainzer, 2003), and among audiologists, 80% are English speakers (Ramkissoon & Khan, 2003). Within the US, only 4% are registered in ASHA as being bilingual. As projections indicate a significant increase in this population, there will not be enough providers to deliver appropriate services. This limitation of Hispanic providers being able to serve their own population in their native language, demonstrates a significant need for professionals to develop necessary skills needed to attain cultural competency and deliver optimal care for improved outcomes post cochlear implantation. As well as allowing for Hispanic families to feel empowered in making decisions about their child, and in turn provide self-advocacy skills, and continue to feel a part of their community and culture.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-1: Language Development in Children
Abstract ID: 36
Title: Engaging Parents Task Force: Bringing Parent Perspective into Clinical Design
Authors:
Erika Gagnon, AuD, Hannah Eskridge, Master of Speech Pathology, Erin Thompson, Master of Science in Speech and Hearing Sciences;The Univ. of North Carolina at Chapel Hill, Durham, NC.
Abstract:
Introduction: For the past two years, our pediatric cochlear implant center has implemented a 'co-treat' model, bringing speech language pathologist and audiologist together for joint appointments. This model has increased collaboration among clinicians and parents throughout our center. While this model has aided in patient care, we felt that further parent outreach was warranted to help isolate the needs specific to low-income families. Socioeconomic status is a key factor impacting a child's ability to acquire age appropriate spoken language, thus increasing the disparity for children with hearing loss born into poverty to meet their language potential. The "Engaging Parents, Develop Leaders" tool is designed to be used as an interactive group exercise to address specific needs of organizations that work with parents. This self-assessment contains four domains: Building a Culture of Respect, Inclusion and Equity, Coaching Parents on Competence and Confidence, Listening to and Forming Partnerships with Parents, and Partnering with other Organizations to Serve the Whole Family. Each domain includes a series of questions with a scaled answer choices of "always, sometimes, never or don't know". Based on scores in each domain, guidance and recommendations are included in this tool to assist the organization undergoing the self-study.
Methods: A task force comprised of clinicians, support staff, parents and university students was assembled to complete the "Engaging Parents, Developing Leaders: A Self-Assessment and Planning Tool for Nonprofits and Schools" tool. A diverse group of patient caregivers were selected, including: a single mother (English as her second language), single father, married couple and grandparents, to attend three task force meetings. The first two meetings allowed for anonymous completion of the questionnaire and wrap-up with a group brainstorming sessions. The final meeting ranked top areas of focus from brainstorming sessions and created an action plan to be executed by our center to better meet the needs of our patients, parents and community.
Results: In this session, the presenter will outline how to utilize the "Engaging Parents, Developing Leaders: A Self-Assessment and Planning Tool for Nonprofits and Schools" tool, including our center's results from each domain to reveal key areas of strength, emerging strengths and key areas for opportunity. Reflection and brainstorming with parents from each of these meetings brought a host of ideas. Key themes from parent discussion will be outlined along with the action plan implemented after the conclusion of the task force.
Conclusion: As a pediatric center, collaboration with our patient's parents is imperative to learn our center's strengths and areas for improvement. Giving parents a voice to share their unique needs and desires has allowed our center to make impactful changes guided by parent input to improve access and quality of services delivered.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-1: Language Development in Children
Abstract ID: 252
Title: Language is Caught, not Taught: Supporting Parents in Developing and Monitoring their Child's Functional Listening Skills to Guide Implantation Decisions, Maximise Listening and Learning Opportunities and Understanding its Impact on Outcomes
Authors:
Aleisha Davis, MPhil, MSLP 1, Robert Cowan, Prof 2, Elisabeth Harrison, Dr 3; 1The Shepherd Ctr., Sydney, Australia, 2HEARing CRC, Melbourne, Australia, 3Macquarie Univ., Sydney, Australia.
Abstract:
Introduction: Evidence and research in the field of cochlear implantation and language development for children with hearing loss and pediatric cochlear implant outcomes has indicated two key areas that have been shown to significantly impact outcomes. The first, the importance of a child's functional listening skills. This is beyond the detection and discrimination of 'hearing', to incorporate the skills necessary in every day environments that involve the cognitive components of 'listening'. The second, the impact of parental input. Given that language is not learnt in a clinical setting, but in every day experiences in a child's natural environments, ways to influence and improve these interactions to maximise their listening and language opportunities can support parents in developing their child's outcomes throughout their cochlear implant journey. The Functional Listening Index-Pediatric (FLI-P) v1.1 has been in use with children with hearing loss from 0-6 years in a number of cochlear implant clinics and early intervention programs internationally. After 4 years of use and data collection from one of these clinics with over 500 children and 2000 data points, for children with all types and degrees of hearing loss using a range of devices, the current study set out to review and redevelop the FLI-P to create v2.0 to support parental use of the tool through cochlear implant candidacy and beyond, without the need for administration by an experienced clinician.
Methods: Analysis and feedback from use of the FLI v1.1 was examined to determine areas for optimisation, review and redevelopment. Additional items were added to support real life listening environments (in noise and using digital signals from early ages). Items were reordered, and wording and scoring simplified to increase reliability and widen use. Data were collected comparing differences in a group of 20 children with cochlear implants, and reliability explored with differences between parent and clinician use, with parents from a range of Socio-Economic and Cultural backgrounds. Qualitative information was gathered from parents and clinicians regarding use and impact on changes in knowledge, behaviour, decisions and clinical practice through the implant process.
Results: Data identified a stronger alignment in sequential order of items and increased sensitivity in development of auditory skills in noise and using digital signals. Qualitative reports from families indicate the difference in knowledge and information of ways to develop listening skills with their child, and steps required in doing so. Parents reported a clear preference in being able to use the tool to track their own child's progress, and resulting increased levels of engagement.
Conclusion: The impact of the FLI-P v2.0 for parents has been a shift in the type and level of information it has provided families to support their decision making through cochlear implant candidacy and beyond, and resulted in greater levels of knowledge of their child's stages of auditory development. A subsequent effect on the natural awareness for parents in maximising appropriate listening opportunities to support their child's development has been evident, and active engagement, involvement and parent-led learning.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-1: Language Development in Children
Abstract ID: 57
Title: Aural Rehabilitation for the Preschooler with Limited Language
Authors:
Michael Douglas, MAEducation, MED EL, Nashville, TN.
Abstract:
Introduction: Despite early detection and intervention practices in the United States, clinicians and deaf educators still encounter children who enter their preschool years with very limited language. The families and service providers of these children, who did not benefit from their well-intended early intervention have many questions about the kind of rehabilitation these children should receive and their effects on the development of adequate spoken language skills. The purpose of this study was to document the effects of structured learning activities on four preschool-aged children with hearing loss and very limited spoken language over a twelve month period.
Methods: Four preschool children with hearing loss age 36 months participated in this study. All 4 participants were severely delayed in spoken language skills as measured by a mean number of different receptive word count of 2 and standard score achievement that was 2 standard deviations below the mean on a norm-referenced omnibus language measure. All 4 participants had 0-3 early intervention experiences. Specific operant-conditioning based speech and language tasks were completed daily in a preschool setting with a teacher of the deaf and once a week in a clinic setting with a SLP who had expertise in children with hearing loss and their parents. Number of different receptive words and first word combination use were collected via spontaneous Language sample procedures at 8 time points over a twelve month period. A repeated measures, one-way ANOVA was performed at each test interval to determine effects of the intervention and an all pairwise multiple comparison procedure via the Holm-Sidak method was completed to identify the significance of improvement between data points. A correlation analysis was performed to determine if the two measures (number of different receptive words and number of different word combinations) were related.
Results: All four participants demonstrated steady and statistically significant improvements in pre/post vocabulary and word combination interventions over the 12 month period. There was a highly significant effect of test interval. Pairwise comparisons revealed significant increases in the number of different receptive words between each consecutive quarter and highly significant increases in the number of different receptive words when comparing pairs of non-consecutive quarters. There were no significant correlations between number of different receptive words and number of different word combinations at any of the test intervals.
Conclusion: Structured language approaches should be considered when working with children with hearing loss between the ages of 3 and 4 who do not demonstrate benefit from birth to three early intervention services. Lack of correlation between number of receptive word knowledge and number of spontaneous word combination use may reflect a difference in cognition and/or information processing required to preform each of the tasks. Rehabilitation considerations for other children with similar profiles as well as future directions for study and practice will be discussed.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-1: Language Development in Children
Abstract ID: 216
Title: Congenital Zika Infection and Hearing Loss
Authors:
Danielle S. Ramos, MMSc 1, mariana leal, pHD 2, lilian muniz, MD 3, silvio caldas neto, pHD 2; 1medicina, Univ.e Católica de pernambuco, recife, Brazil, 2cirurgia, Univ.e Federal de Pernambuco, recife, Brazil, 3cirurgia, Univ.e Federal de pernambuco, recife, Brazil.
Abstract:
Introduction: It's now well known that congenital infection with congenital Zika syndrome (CZS) causes not only microcephaly and brain abnormalities but a lot of others organs damages such as visual impairment, orthopedic malformations and hearing loss. A previous report by the authors had already shown the association between congenital infection with Zika virus (ZikV) and congenital hearing loss with a prevalence of 5.8%, which is similar to that seen in association with other congenital viral infections.
Methods: In the present report 139 children with laboratorial confirmation of ZikV infection, positive Zika virus-specific immunoglobulin M (IgM) capture enzyme-linked immuno- sorbent assay (ELISA) performed on cerebrospinal fluid (9), were tested with measurement of the short latency auditory brainstem response (ABR) to click stimuli, and was considered to be normal when wave V (the fifth and most prominent and consistent wave) was identified in two con- secutive averaged waveforms at 35 decibels normal hearing level (dB nHL). If the first screening test was not normal, it was repeated approximately 1 month later. If the second test also indicated hearing loss, a diagnostic confirmatory frequency-specific ABR was conducted, in which the stimuli were tone bursts at frequencies of 500 and 2,000 Hz. The diagnosis of hearing loss was confirmed if hearing thresholds exceeded 25 dB nHL. A behavioral auditory testing with musical instruments in open field was also performed.
Results: From 139 newborns with confirmed CZS, seven had diagnosis of SNHL. One of these children was excluded because she was exposed to ototoxic drug before the first screening test, resulting in an incidence of 6/138 (4.3%). From these six affected children, four had been tested with a second FS-ABR conducted after 11 to 16 months after the first diagnosis. In all of them, the second test confirmed the result of the first one. The mean head circumference size in the group with SNHL was (27.3) smaller than those without SNHL (29.1) and this difference was significant (p=0.04), but otherwise there were no significant differences in characteristics or medical history between the two groups.
Conclusion: Congenital infection with Zika virus should be considered a risk factor for hearing loss. Children with evidence of congenital Zika virus infection who have normal initial screening tests should receive regular follow-up, because onset of hearing loss associated with other congenital viral infections can be delayed and the loss can be progressive.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-1: Language Development in Children
Abstract ID: 59
Title: From Research to Clinical Practice: Proposed Test Battery and Mapping Procedures for Cochlear Implant Recipients with Unilateral Hearing Loss
Authors:
Andrea L. Bucker, Doctor of Audiology 1, English R. King, Doctor of Audiology 1, Meredith A. Rooth, Doctor of Audiology 2, Margaret T. Dillon, Doctor of Audiology 2; 1Department of Audiology, UNC Hosp., Chapel Hill, NC, 2Otolaryngology/ENT, UNC Sch. of Med., Chapel Hill, NC.
Abstract:
Introduction: Patients who present with substantial unilateral hearing loss (UHL), with moderate-to-profound hearing loss in one ear and normal hearing in the contralateral ear, report poor speech perception in noise, localization, and quality of life. Currently approved treatment options for substantial UHL include contralateral routing of signal (CROS) hearing aids and bone-conduction hearing aids (BCHA); however, these solutions do not provide binaural cues. Recent investigations have demonstrated cochlear implantation of the poorer hearing ear may be a viable treatment option for these patients. Cochlear implant (CI) recipients with substantial UHL experience improved speech perception in noise, localization, and quality of life as compared to unaided conditions or when listening with CROS hearing aids or BCHAs. With the rise of this treatment option, clinical audiologists must consider how to translate the research test battery and CI fitting methods into clinically-feasible protocols. The present report reviews the research test battery and CI fitting methods for subjects participating in a clinical trial on CI in UHL, and discusses how it can be applied clinically.
Methods: Twenty subjects received their CI as part of a FDA clinical trial investigating cochlear implantation in cases of unilateral hearing loss. The research test battery included measures of unaided and aided thresholds, speech perception in spatially-separated noise, localization, and quality of life. The test battery took approximately 3 hours to complete. Subjects completed mapping procedures that differed from mapping procedures of conventional CI recipients. The research and clinical audiology teams reviewed how the test battery could be modified once subjects completed the study endpoint and were followed by the clinical team. Considerations included duration of test time, consistency of measures for review of long-term performance, soundbooth set-up, and what mapping procedures may optimize subject performance.
Results: Revised test battery and mapping procedures, as compared to that used for conventional CI recipients, were created for CI in UHL subjects considering the normal hearing in the contralateral ear and research findings. The test battery used in the clinical trial was modified to be clinically feasible (approximately 30 to 45 minutes, depending on the interval) while maintaining consistent data to review long-term performance. The proposed test battery and mapping procedures will be discussed.
Conclusion: Patients with substantial UHL may experience improved speech perception, localization, and quality of life with the use of a cochlear implant. Clinical audiologists must consider the optimal test battery and mapping procedures to effectively evaluate and treat CI recipients with normal hearing in the contralateral ear.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-2: Expanding Indications / Medical Considerations
Abstract ID: 219
Title: In Vitro and In Vivo Models to Test the Effects of Electrical Stimulation on the Inner Ear
Authors:
Adrien Eshraghi, MD, MSc 1, Christopher O'Toole, PhD 1, Jorge Bohorquez, PhD 1, Emre Ocak, MD 1, Jeenu Mittal, MSc 1, Carolyn Garnham, MSc 2, Rahul Mittal, PhD 1; 1Hearing Research Laboratory, Univ. of Miami, MIAMI, FL, 2Med-El Limited, INNSBRUCK, Austria.
Abstract:
Introduction: While there is a trend to implant patients with residual hearing, we know that cochlear implantation may cause some loss of this residual hearing. The direct effect of implantation of the electrode in macroscopic structures of the inner ear is well described, however, the effect of the electrical field generated by the implant has not been investigated to date. Some recent data suggests that the electrical stimulation can have a negative effect on the auditory system. However, the role of such stimulation on sensory cells in vitro and on hearing ability in vivo is not well established. The objective of this study was to determine the effect of electrical stimulation on auditory system employing in vitro and in vivo models.
Methods: A custom stimulator circuit that allows to study several parameters, including stimulation amplitude, pulse width, and total stimulation duration was designed. For the in vitro work, organs of Corti explant cultures from P3 rats were used. For in vivo work, the adult guinea pigs were implanted with a cochlear implant and subjected to a number of periods of electrical stimulation via constant activation of the implant. Stimulation was applied with varying parameters to determine the effects of the stimulation on the survival of hair cells. Survival was quantified by counting hair cells in organ of Corti explants using confocal microscopy. Auditory Brainstem Recordings were performed to determine hearing thresholds in the guinea pig model.
Results: In the present study, a compact and easily-adjustable stimulator circuit was developed. It has sufficient flexibility to imitate a wide range of cochlear implant settings. By varying the amplitude, pulse width, and time parameters, we are able to achieve the simulation required for the electrical effects similar to a cochlear implant. There was a decrease in hair cell count in the explants exposed to higher duration of stimulation. In vivo testing revealed the possibility of testing the effects of changing various stimulation parameters on hair cell survival, oxidative stress and inflammation in the cochlea.
Conclusion: The electrical stimulator developed in this study helps to better understand the effect of electrical field on inner ear sensory cells. The models developed in this study using electrical stimulation can be used as a powerful tool to screen otoprotective drugs for the preservation of residual hearing post-cochlear implantation.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-2: Expanding Indications / Medical Considerations
Abstract ID: 21
Title: Expanded Indications for Cochlear Implantation: Unilateral Hearing Loss
Authors:
Harold Pillsbury, MD 1, Margaret Dillon, AuD 1, Emily Buss, PhD 1, Meredith Rooth, AuD 1, English King, AuD 2, Kevin Brown, MD, PhD 1; 1Otolaryngology/Head and Neck Surgery, Univ. of North Carolina at Chapel Hill, Chapel Hill, NC, 2Audiology, UNC HealthCare, Chapel Hill, NC.
Abstract:
Introduction: Patients with substantial unilateral hearing loss (UHL) or Single-Sided Deafness (SSD) experience poor speech perception in noise and limited localization as compared to normal-hearers. Unfortunately, approved treatment options for UHL and SSD do not provide significant improvements in speech perception in challenging listening conditions and localization. These treatment options route the signal from the affected ear to the normal hearing ear, limiting access to binaural cues. Cochlear implantation has been explored as a potential treatment option for cases of UHL and SSD. The cochlear implant stimulates the affected auditory pathway, and may offer improvements in speech perception in noise and localization. The present report reviews the preoperative and post-initial activation speech perception and localization of CI recipients with UHL to assess its effectiveness as a treatment option.
Methods: Twenty (20) subjects with UHL underwent preoperative testing, cochlear implantation, and follow-up assessment as part of a single-site clinical trial. Subjects were assessed preoperatively in the unaided condition (normal hearing ear alone, NH-alone) and with a bone-conduction hearing aid (BCHA+NH). Subjects were assessed in the NH-alone condition and with the cochlear implant plus the NH ear (CI+NH) condition at 1, 3, 6, 9 and 12 months post-initial activation. The test battery included measures of speech perception in spatially-separated noise and localization. Speech perception was assessed using AzBio sentences in a 10-talker babble at 0 dB SNR. Localization was evaluated using noise bursts presented randomly across 11 speakers at varying intensity levels.
Results: Preoperatively, speech perception in noise was similar or poorer in the BCHA+NH condition as compared to the NH-alone condition. Localization was significantly worse in the BCHA+NH condition as compared to the NH-alone condition. Subjects demonstrated a significant improvement on speech perception in noise and localization with the CI+NH over the NH-alone condition as early as the 1-month follow-up interval. Performance on both tasks continued to improve through the 12-month interval with the CI+NH.
Conclusion: Subjects with UHL experienced a significant improvement with the CI+NH on measures of speech perception in noise and localization that were evident as early as one month of listening experience. Performance with the CI+NH exceeded that of the BCHA+NH condition. These results support the idea of expanding cochlear implantation candidacy criteria to include those with UHL and SSD.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-2: Expanding Indications / Medical Considerations
Abstract ID: 19
Title: Cochlear Implantation in Young Children with Single Sided Deafness: Characteristics and Early Data
Authors:
Lisa R. Park, AuD, Meg Dillon, AuD, Meredith Rooth, AuD, Holly Teagle, AuD, Kevin D. Brown, MD, PhD;Otolaryngology/Head and Neck Surgery, Univ. of North Carolina at Chapel Hill, Chapel Hill, NC.
Abstract:
Introduction: Treating children with substantial unilateral hearing loss (UHL) is typically limited to rerouting of signals to the better hearing ear. An ongoing clinical trial is evaluating whether young children with UHL experience an improvement in speech perception, localization, and quality of life (QOL) with cochlear implant (CI) use. The present report will review pre-operative findings and early outcome data.
Methods: Children between 3.5-6.5 years with moderate to profound UHL were enrolled. The pre-operative test battery included pediatric and parental QOL questionnaires, speech perception, and localization assessment. These measures were repeated post-activation and localization testing was carried out with and without the CI.
Results: Pre-operatively, subjects reported greater cognitive and general fatigue than their parents reported perceiving. Improvements in speech perception, localization, and QOL were demonstrated as early as 3 months post-activation.
Conclusion: Children with UHL tend to perceive greater difficulty with fatigue than their parents' rankings would suggest. Early data suggests that CI use in children with substantial UHL provides improvements in speech perception, localization, and QOL, even within the early months of device use.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-2: Expanding Indications / Medical Considerations
Abstract ID: 142
Title: Cochleostomy and Facial Recess Packing Alter Cochlear Implant Electrode Location in a Human Cochlea Model
Authors:
Matthew M. Dedmon, MD, PhD 1, Brendan P. O'Connell, M.D. 2, Robert J. Yawn, M.D. 1, Alejandro Rivas, M.D. 1; 1Otolaryngology, Vanderbilt Univ. Med. Ctr., Nashville, TN, 2Otolaryngology, Univ. of North Carolina at Chapel Hill, Chapel Hill, NC.
Abstract:
Introduction: Variations exist in surgical techniques for packing the cochleostomy and facial recess during cochlear implantation which may influence electrode location. We seek to determine the effect of cochleostomy and facial recess packing on cochlear implant electrode distance from the modiolus using a model of the human cochlea.
Methods: Two otolaryngology residents (PGY5 and PGY6) and one attending ear surgeon participated in this study. Using a model of the human cochlea, each subject performed electrode insertions using a perimodiolar electrode (Cochlear ® Slim Modiolar 532 ™, CI532) and a lateral wall electrode (Cochlear ® Slim Straight 522 ™, CI522) via a cochleostomy site. Packing material was simulated using cotton and placed into the cochleostomy and facial recess after insertion under the following conditions: 1) inferior to the electrode, 2) superior to the electrode, 3) both inferior and superior, and 4) no packing. Outcome measurements included mean distance of the electrode from the modiolus at the proximal, middle, and distal basal turn of the cochlea, as measured by analysis of photomicrographs taken with the model.
Results: For the CI532, packing of the cochleostomy and facial recess superior to the electrode resulted in a statistically significant decrease in distance from the modiolus at both the middle and distal basal turn regions compared to the inferior, and inferior and superior conditions. The difference in modiolar proximity when specifically comparing superior to inferior packing was considerable in the middle basal turn region (0.25 mm vs. 1.92 mm, respectively, $p<0.001$). For the CI522, packing superior to the electrode array similarly resulted in a significantly decreased distance to the modiolus when compared to the inferior, and inferior and superior packing conditions, at both middle and distal basal turn regions. When examining modiolar proximity at the middle basal turn, differences in superior vs inferior conditions (1.25 vs. 1.75 mm, respectively, $p=0.002$) were less pronounced than those observed for CI532 insertions.
Conclusion: Packing of the cochleostomy site and facial recess has a significant effect on electrode distance from the modiolus in the middle and distal basal turn using a model of a human cochlea. Effects were more pronounced when using a perimodiolar (CI532) electrode.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-2: Expanding Indications / Medical Considerations
Abstract ID: 39
Title: VHIT Testing in Cochlear Implant Patients
Authors:
David Kaylie, MD, Erin Blackburn, Au.D., Doug Garrison, Au.D., Kristal M. Riska, PhD;Head and Neck Surgery & Communication Sciences, Duke Univ. Med. Ctr., Durham, NC.
Abstract:
Introduction: The clinical incidence of vestibular complaints after cochlear implants is generally low. Studies designed to assess the incidence of vestibular hypofunction post implantation generally report caloric testing results as the main outcome measure. There is a wide range of vestibular dysfunction reported across many studies, ranging from normal postoperative function to very high rates of vestibular hypofunction. Caloric testing can be heavily impacted by surgical alterations, like mastoidectomy, and the patients' ability to be tasked during testing. Mastoidectomy alters the bony anatomy of the mastoid, which has a strong impact on heat distribution during caloric exams. Patients are also required to be tasked during testing to prevent suppression of the response secondary to reduced alertness. Mental tasking can be difficult due to the severity of the hearing loss coupled with testing in a vision denied condition. vHIT measures vestibular function independent of mastoid anatomy, is performed with a fixation target, and is quick to administer. Moreover, vHIT evaluates vestibular function using a physiologic stimulus at velocities encountered in daily activities. For these reasons, we sought to investigate vHIT testing, as compared to calorics, in patients who have undergone cochlear implantation
Methods: 15 patients were enrolled in the current study. vHIT and caloric testing was performed prior to cochlear implantation with MedEl Flex28 electrodes and again at their 3-month postoperative visit. The vHIT measurements obtained were gain in the lateral plane and the presence of overt and covert saccades. We also measured bilateral maximal slow phase velocity for warm and cold calorics and percentage unilateral weakness. Dizziness handicap inventory scores were collected at each visit.
Results: There was no significant difference in vHIT gain between preoperative testing and 3 months postoperative testing with mean values of 0.9175 preop and 0.9125 postop. There was no significant difference in presence of overt or covert saccades between the two time periods. 3 month postoperative calorics were not significantly different for both warm and cool calorics bilaterally. No significant difference in mean %UW was observed. Mean %UW during preoperative testing was 20 and during postoperative testing was 18.2. Mean DHI score preoperatively was 11 (range: 0 to 48) and postoperatively was 12 (range: 0 to 28). There was no significant difference in DHI score.
Conclusion: vHIT is a safe and reliable measure of vestibular function in patients receiving cochlear implants, and can be easily administered to a hearing-impaired population. Unlike caloric testing, vHIT testing is independent of changes in bony anatomy. It also does not rely on tasking the patient during testing and provides a response in a normal physiologic range.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-2: Expanding Indications / Medical Considerations
Abstract ID: 246
Title: Self-Reported Benefits after Implantation in a Group of Hybrid Implant Recipients
Authors:
David Kelsall, MDRocky Mountain Ear Ctr., Englewood, CO.
Abstract:
Introduction: The benefits of electric plus acoustic stimulation in patients with ski-slope sensorineural hearing loss are well established and include improved speech understanding in quiet and in noise, more natural sound quality, and better localization ability. This population was previously left untreated until the indication to treat those with such residual hearing profiles was expanded. That is, hearing aids were unable to provide appropriate amplification in the high-frequency region to aid in speech understanding, leaving users largely dissatisfied. In recent years there has been increased demand by regulatory agencies, professional academies, and payers to provide data on patient-reported outcomes, including health utility scores, in addition to the traditional objective measures such as audiometric profiles and speech perception data to validate the use of cochlear implant technology. Such information has been and continues to be collected in hybrid implant users with interim data reported herein.
Methods: The Health Utility Index (HUI) (Furlong, W., Feeny, D., Torrance, G.W., Barr, R.D., 2001) is a validated, 15-item population-based health utility instrument that postulates the domains of health as hearing, vision, speech, emotion, pain, ambulation, dexterity, cognition, and self-care. Participants in a multi-center prospective clinical study evaluating the long-term safety and effectiveness of a cochlear implant array designed for those with ski-slope sensorineural hearing loss completed the HUI3 questionnaire pre-operatively and at 6 and 12 months postoperatively.
Results: Patients reported significant improvement in the hearing and multi-attribute domains of the HUI3 at 6 months post-implantation that remained stable after 12 months. Given that data collection is ongoing the most up to date results on these and other measured domains will be provided.
Conclusion: The Health Utility Index Scale is sensitive to changes in patient-reported health-related domains following implantation in patients with a hybrid cochlear implant. These data support the use implantable technology for those who meet the expanded indication.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-2: Expanding Indications / Medical Considerations
Abstract ID: 202
Title: Establishing Cochlear Implants as the Standard of Care for Treatment ofPatients with Severe to Profound Sensorineural Hearing Loss
Authors:
Brian Kaplan, M.D.Greater Baltimore Med. Ctr., Baltimore, MD.
Abstract:
Introduction: The benefits of implantable technology for treatment of severe to profound sensorineural hearing loss are well established. The use of electric stimulation with or without acoustic information in the ipsilateral or contralateral ear provides audibility across the speech spectrum, enabling detection, discrimination, identification, and comprehension of sounds at varying degrees for a given individual. Current estimates suggest that there are over 360 million people worldwide with disabling hearing loss. Of those, an estimated 55 million would benefit from treatment with hearing aids and 1,000,000 hearing aid users could benefit from a cochlear implant. Government agencies such as the U.S. Food and Drug Administration and the World Health Organization have recognized that hearing loss is a significant public health issue and efforts are underway to make hearing technology more accessible. In order to keep up with the increasing demand for treatment it is clear that a new standard of care must be developed.
Methods: The authors looked at a 4 pillared approach to changing the standard of care as follows: 1) Establish the reason behind the importance of hearing loss 2) Develop a consensus statement from an international panel of experts regarding the proper diagnosis and treatment of severe-profound hearing loss 3) Expand the use of data analytics to pursue updates to health economics, market access, and regulatory approval 4) Redesign the clinic delivery model to utilize technology such as remote care, connected health, and other technologies
Results: The crucial importance of creating the standard of care for the diagnosis and treatment of severe to profound hearing loss will be highlighted. Utilizing available data analytics, the creation of consensus statements and practice guidelines, redesign of the delivery model, and demonstrating the link with other serious medical conditions all play vital roles.
Conclusion: Modifying current clinical practice to make it scalable is of critical importance in order to make a standard of care model. A review of the multifactorial approach to create the standard of care for cochlear implantation will be presented.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-3: Programming and Other Outcome Factors
Abstract ID: 113
Title: Effect of Stimulation Rate on Patient Performance and Preference
Authors:
Maureen Wargo, AuD, MBA, Lori Nixon, MA, Molly Brown, MA;Audiology, VA, Pittsburgh, PA.
Abstract:
Introduction: Vaerenberg et al. (2014) conducted a global survey of cochlear implant (CI) programming practices and found only 6% of CI audiologists even occasionally change rate of stimulation during CI programming. The effect of stimulation rate on subjective and objective performance in CI recipients has not been studied since 2006 when rate of stimulation was evaluated as part of the Freedom clinical trials. With the advent of new processing strategies and expanded implantation criteria, a modern evaluation of stimulation rate is necessary. In our clinic we routinely program recipients with various rates of stimulation in an attempt to optimize performance. A review of patients' preferred MAPs over the past three years reveal that only 30% routinely use a MAP created with a 900Hz stimulation rate. This QI project was implemented to thoroughly evaluate stimulation rate using a more standardized protocol. We evaluated subjective preference for stimulation rate and objective word and sentence recognition scores per stimulation rate over time.
Methods: Ten new CI recipients were programmed using 720, 900, 1200, and 1800 Hz stimulation rates over a 5 week period. A rigorous, uniform schedule was followed during initial programming to include: Day 1: Initial activation Program using 900 Hz stimulation rate with counted T's and measured C's Day 2: One day post activation Program using 900 and 1200 Hz stimulation ratesProvide both MAPs for home use Day 3: One week post activation Identify preferred program/stimulation rate Complete CNC word testing for the 900 and 1200 Hz MAPsReprogram and optimize the 900 and 1200 Hz MAPs Day 4: Two weeks post activation Identify preferred program/stimulation rate Complete CNC word testing for the 900 and 1200 Hz MAPsIf the 900 Hz MAP is preferred, reprogram using 720 HzIf the 1200 Hz MAP is preferred, reprogram using 1800 Hz Day 5: Three to five weeks post activation Identify preferred program/stimulation rate Complete CNC word testing for current MAPs Optimize and create programs for the preferred rate of stimulation Complete AzBio sentence testing following initial activation with Day 1 MAP and after 5 weeks of CI use with Day 5 optimized MAP. During the last session, patient perception for both the Day 1 MAP and Day 5 MAP will be judged for sound quality and speech understanding using a Likert scale of 1 to 5.
Results: Data collection is almost complete. A repeated measures ANOVA will be used to analyze the difference between stimulation rates for CNC word scores. A dependent t-test will be used to analyze the difference between subjective rate preference and performance with Day 1 MAP vs optimized, final MAP.
Conclusion: Analysis is still underway. We will focus conclusions/discussion on clinical relevance and the application of this material into a comprehensive CI programming protocol.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-3: Programming and Other Outcome Factors
Abstract ID: 117
Title: Audiologists' Preferences in Programming Cochlear Implants: A Preliminary Report
Authors:
Leanne M. Browning, BS 1, Yingjiu Nie, Ph.D. 1, Ayasakanta Rout, Ph.D. 1, Meredith Heiner, Au.D. 2; 1Communication Sciences and Disorders, James Madison Univ., Harrisonburg, VA, 2Audiology, Virginia Commonwealth Univ. Hlth. System, Richmond, VA.
Abstract:
Introduction: Cochlear implants have become a viable option for those with severe to profound sensorineural hearing loss and little to no word recognition ability. However, the techniques audiologists use to program these devices are not standardized. There is little data available which analyzes how audiologists handle clinical cochlear implant programming between the top manufacturers. These companies supply default settings in their products, but is it unknown how often audiologists use these in practice in the United States.
Methods: In the present study, a questionnaire was designed based on the European model by Vaerenberg et al. (2014) which addresses which settings professionals are using with their patients, how they approach bimodal fitting with a cochlear implant and a hearing aid, and which tests they use to evaluate patient and device performance. This questionnaire was distributed through the platform, Qualtrics, to cochlear implant audiologists throughout the United States by email. Audiologists were selected for participation based on pre-existing contacts and their membership in audiology social media groups. Participant recruitment will continue until 50 responses are recorded. To limit survey participation, only those who supplied their email address to the researcher were given a link to complete the survey. Additionally, all responses remain anonymous, and information from the optional incentive survey is separated from survey data.
Results: Preliminary results indicate a preference for the default value for some parameters, like default pulse width, but not others. Additionally, there are differencesbetween manufacturers, including in the use of default strategy. Relative to Cochlear, there is a trend toward less use of default for MED-EL and Advanced Bionics. Preferences for bimodal fitting techniques trend toward using a partner company's hearing aid, like Cochlear and ReSound, when available, and using the manufacturer's bimodal fitting formula.
Conclusion: It is expected that there will continue to be a trend of audiologists preferring to use manufacturer default settings for at least some parameters as more data is collected. New and experienced audiologists may benefit from this research in that they may better understand the state of the art of cochlear implant programming. It is clear that there is much variability among audiologists' cochlear implant programming practices, and documenting these differences is important for the betterment of the field.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-3: Programming and Other Outcome Factors
Abstract ID: 193
Title: Evidence-based Approaches for Efficient Programming of Adult Cochlear Implant Users Over Time
Authors:
Emalka A. Gajadeera, PhD, Karyn L. Galvin, PhD, Richard Dowell, PhD, Agnes Au, PhD;Audiology and Speech Pathology, The Univ. of Melbourne, Melbourne, Australia.
Abstract:
Introduction: Cochlear implants have provided restoration of hearing for hundreds of thousands of people worldwide. To ensure stimulation levels are adequate for the recipient over time, programming sessions are currently provided throughout the recipient's lifetime. The median increase in caseload for a clinic is reported to be 62 implant users per year; however, with an aging population, this number is expected to rise. Given the significant reliance on hospital resources for ongoing management of implants, more efficient approaches for programming is necessary to ensure that resources are adequately distributed amongst current and future users. The primary aim of this study was therefore to provide evidence-based approaches for programming implants. This was achieved by integrating recently published findings on the changes in electrical stimulation levels in the early post-implantation period and changes in levels over the first decade post-implantation for a large group of adult implant users. Significant associations of demographic characteristics with changes in levels and the number of sessions attended over time were also investigated.
Methods: 680 participants using implants with a consistent stimulation mode and rate were included. For each participant, changes in stimulation levels were investigated as a function of dynamic range over 2 years post-implantation. For the 128 of these participants who had adequate long-term data, the amount of change in current levels over the first 10 years was determined using regression coefficients. To investigate the effects of electrode array segment, analyses were conducted separately for the apical, medial, upper-basal, and lower-basal segments. Etiology was classified into 6 pathological groups.
Results: Stability in electrical stimulation levels was evident after the first 3 to 6 months for more than 75% of the participants. A significantly greater degree of change in levels was evident for the basal segments, however, significant segmental differences were not evident in the long term. A significantly greater degree of change was evident in the early post implantation period for participants with Otosclerosis, and those with prelingual onset of deafness, however, this was not evident in the long term. For all participants, regardless of demographic characteristics, the mean amount of change over 10 years post-implantation was less than 11 current levels (standard deviation of < 10 current levels). The number of sessions attended was most variable in the first 3 months post-implantation, but was otherwise reflective of the number of sessions outlined in the hospital's protocol for programming.
Conclusion: There is strong evidence that particular factors are associated with significantly greater degree of change in levels in the early post-implantation period. Interestingly, once levels stabilize, little change in levels should be expected over the first decade of implant use. The findings suggests that implant users are likely to be attending sessions as requested by the clinician rather than due to programming needs. The integration of these findings from a large group provided sufficient evidence to develop an evidence-based schedule and approaches to programming adult implant users. Clinical application of the proposed evidence-based approaches will enable more efficient programming services to be provided to current and future implant users over time, without compromising patient care.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-3: Programming and Other Outcome Factors
Abstract ID: 217
Title: Electrocochleography Estimates Residual Hearing in Cochlear Implant Recipients: A Multi-Center Study
Authors:
Jourdan T. Holder, AuD 1, Kanthaiah Koka, PhD 2, Robert Dwyer, AuD 1, William J. Riggs, AuD 3, Michael S. Harris, MD 4, Brendan O'Connell, MD 5, Amanda Ortmann, PhD 6, Craig Buchman, MD 6, Oliver F. Adunka, MD 3, Leo Litvak, PhD 7, Robert F. Labadie, MD, PhD 1; 1Hearing and Speech Sciences, Vanderbilt Univ. Med. Ctr., Nashville, TN, 2Advanced Bionics, Valencia, CA, 3Ohio State Med. Ctr., Columbus, OH, 4Med. Coll. of Wisconsin, Milwaukee, WI, 5Univ. of North Carolina, Chapel Hill, NC, 6Washington Univ. Sch. of Med., St. Louis, MO, 7Advanced Bionics, Valencia, TN.
Abstract:
Introduction: In cochlear implant (CI) patients with preserved residual hearing, the CI electrode can be used to record close-proximity electrocochleography (ECochG) responses to an acoustic pure-tone stimulus. The objective of the present multi-center study was to determine if thresholds estimated based on cochlear microphonic magnitude ("CM thresholds") can be used to accurately predict pure-tone post-operative audiometric thresholds in CI recipients with residual hearing.
Methods: Seventy (mean age = 52 years, SD = 14) adult patients with a HiRes90k cochlear implant and a HiFocus mid-scala electrode array participated in this study. Behavioral pure-tone thresholds for warble tones were measured using insert ear phones for 125 to 4000 Hz post-operatively. ECochG waveforms were recorded on the most apical electrode of the implant array in response to calibrated pure tones and were used to estimate the CM thresholds. The frequencies with behavioral "No Responses" were replaced with 5 dB above audiometric tested stimulus levels.
Results: CM thresholds and behavioral audiometric thresholds could be measured for 63 subjects. Seven subjects showed neither behavioral nor ECochG responses. A strong correlation ($r^2 = 0.85$, $p < 0.001$) was observed between CM thresholds and the behavioral audiometric thresholds. The mean absolute difference between the ECochG responses and audiometric thresholds was 9 dB (STD=10.0).
Conclusion: CM thresholds collected post-operatively from the CI electrode may be used as a more time efficient way to routinely measure and monitor residual hearing in CI recipients.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-3: Programming and Other Outcome Factors
Abstract ID: 50
Title: Use of Sentential Context During Speech Recognition in Adults with Cochlear Implants
Authors:
Aaron C. Moberly, MD, Jessa Reed, PhD;Otolaryngology, The Ohio State Univ., Columbus, OH.
Abstract:
Introduction: Sentence context facilitates comprehension, particularly under challenging listening conditions (e.g., in noise or when hearing a degraded signal). Consequently, to "make sense" of the speech stream, cochlear implant (CI) users may rely on sentential context more than their normal-hearing (NH) counterparts. Yet research suggests that CI users vary in their abilities to utilize context. One line of findings suggests that we can only capitalize upon context cues when the speech signal is sufficiently clear, such that individuals with poorer perception will be less likely to benefit from context. Alternatively, other research suggests that use of context primarily "kicks in" when the signal quality is poor. The current study tackles this debate by examining the extent to which CI users benefit from sentential context as a function of the quality of the sensory input, and how this use of context relates to listeners' cognitive abilities.The objective of this study was three-fold: (1) To investigate whether the use of sentential context depends on the quality of the sensory input; (2) To examine whether neurocognitive functions (working memory capacity, processing speed, inhibitory control, and nonverbal reasoning) relate to the ability to use sentential context; and (3) To determine whether, as a result of their prolonged hearing loss, adult CI users use sentential context to a greater degree than NH peers.
Methods: Data from 81 adults were analyzed: 41 were experienced CI users, and 40 were NH controls. CI participants were assessed in quiet for isolated word recognition, recognition of meaningful sentences, and recognition of semantically anomalous sentences. NH controls were tested using the same materials that were spectrally degraded through 8-channel noise-vocoding. All participants were also tested using a battery of neurocognitive measures.
Results: The degree to which CI participants used sentential context depended on the quality of sensory input (i.e., isolated word recognition) in a quadratic fashion; that is, use of sentential context was greatest at intermediate levels of isolated word recognition. The same was not true for NH controls. A trend was found for inhibitory control as a predictor of the degree of use of context. Lastly, CI and NH participants made use of context to a similar degree.
Conclusion: Adult CI users make use of sentential context to aid in speech recognition, and do so optimally at intermediate levels of sensory degradation. Inhibitory control may play a role in this process. These findings provide further evidence for the interaction of sensory and cognitive processing during spoken language recognition under degraded listening conditions. They also suggest the potential application of aural rehabilitation approaches aimed at improving use of sentential context to optimize outcomes for adults with CIs.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-3: Programming and Other Outcome Factors
Abstract ID: 208
Title: The Relationship between Communication Abilities and Friendship Quality in Adolescents with Cochlear Implants
Authors:
Christine Evans, M.S., Andrea D. Warner-Czyz, PhD;School of Behavioral and Brain Sciences, The Univ. of Texas at Dallas, Richardson, TX.
Abstract:
Introduction: Historically, adolescents with hearing loss feel lonelier, less socially accepted,have more difficulty making and maintaining friends, and experience higher rates of peervictimization versus hearing peers. Quality friendships can protect adolescents from feelinglonely or experiencing peer victimization even if they are socially rejected from a peer group,thereby acting as an essential component of quality of life. We do not know the extent to whichcochlear implants (CIs) affect the quality of social relationships and social participation, and thepossible effect of communication deficits associated with hearing loss on such social outcomes.This study examined friendship quality in adolescent CI users and the relationship betweenfriendship quality and self-reported communication abilities.
Methods: Participants included 32 adolescents (12-18 years) wearing at least one CI. All usedoral communication. All participants independently completed an online survey that included: (a)A demographic questionnaire with items about peer relationships and social engagement; (b)communication competence ratings of speech perception and speech intelligibility. Participantswho reported at least one friend (n=24) also completed a 40-item Friendship QualityQuestionnaire (FQQ) (Parker & Asher, 1993), which clusters peer relationship characteristicsinto six subscales of friendship quality (validation and caring; conflict and betrayal, companionshipand recreation, help and guidance, intimate exchange, and conflict resolution). Spearman correlationcoefficients assessed associations among self-reported speech perception in noise, speechperception in quiet, and FQQ scores.
Results: Mean FQQ scores across all domains mirrored patterns in published reports ofchronologically younger children with typical hearing and diverged from patterns reported inage-matched peers with typical hearing. A significant correlation emerged between mean FQQrating and speech perception in noise such that adolescents who reported poorer speechperception in noise also reported overall lower quality friendships (p<..001).
Conclusion: The impact of HL on social well-being demands attention, especially inadolescence when friends take a more prominent social role over family. Speech perception innoise may provide information about risk for decreased social satisfaction, possibly because CIusers may avoid peer interaction and social events in difficult listening situations (school dance,cafeteria, concerts). Future work should explore the relationship between friendship quality andother aspects of quality of life such as life satisfaction in adolescent CI users. Identification ofthe role of CI on social well-being will drive changes in counseling, signal processing, accessorydesign, and communication strategies to enhance quality of life in adolescents using CIs.

CI2018 DC Podium and Poster Highlight Abstracts

Session: PH-3: Programming and Other Outcome Factors
Abstract ID: 14
Title: Effect of Telephone Training on Phone Use and Auditory Identification in Adults with CIs
Authors:
Elaine R. Smolen, MAT, LSLS Cert. AVEdHealth and Behavior Studies, Teachers Coll., Columbia Univ., New York, NY.
Abstract:
Introduction: Although technological advances, such as text messaging, Skype, and social media, have increased communication access for adults with hearing loss, using the telephone remains an important skill for everyday life, particularly in business settings (Lyford, Worsfold, & Johnson, 2015). Adult cochlear-implant (CI) users, even those with strong speech recognition in face-to-face conversation, report difficulty comprehending speech over the phone because of the degraded auditory signal and background noise. For these individuals, a lack of confidence and negative initial experiences with the telephone immediately post-implantation significantly affect the daily use, or nonuse, of the phone (Fu & Nogaki, 2005). Only a few recent studies have investigated strategies to build CI users' speech discrimination skills and confidence placing and receiving calls on the telephone, with most using proprietary training programs that limit replicability (de Sousa et al., 2015; Lyford et al., 2015; Mathur, Jeyaraman, Mathur, & Batra, 2015). This study explored the efficacy and feasibility of using a widely available free resource to conduct telephone training.
Methods: This pilot study investigated the effects of a telephone training program on the auditory-identification skills and frequency of telephone calls made and received by an adult CI user. One participant, a 33-year-old male with profound hearing loss and bilateral CIs, took part in the A-B multiple-probe, single-case-design study. The researcher, a certified Listening and Spoken Language Specialist, conducted nine training sessions using sentence matrices, widely available as part of a free resource for CI recipients. The participant practiced identifying words in four- to seven-word sentences in person, over the phone in quiet, and over the phone in noisy conditions and role-played common telephone scenarios during the training. The participant's auditory identification of 20 seven-word sentences presented over the phone in noise was measured in baseline and maintenance probes. His frequency of phone calls placed and received during the baseline, intervention, and maintenance phases was also recorded.
Results: The participant's independent use of the telephone and auditory-identification skills both increased following nine training sessions. The participant's accuracy in auditory identification improved from 65% during baseline to 90% during maintenance. His frequency of telephone use was stable at 0 or one call per week during baseline and intervention, but increased to a mean of four calls per week during the maintenance phase. The free resource used during training was rated easy to use and adaptable for intervention with other teens and adults. Graphs of the experiment's results will be presented.
Conclusion: This study offers evidence that motivated adults who use CIs can improve their listening skills in the auditory-only condition on the phone and increase their frequency of phone use. Adults and their family members can adapt the free sentence matrices over nine short training sessions. Future studies will seek to replicate the results of this experiment with using a multiple-baseline-across-participants design while also incorporating role-play of situations that are socially significant to the individuals. Although more research using rigorous experimental design is needed, the data show promise for improving the telephone skills of adults with CIs.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-1: Understanding Pediatric Outcomes
Abstract ID: 73
Title: Developing a Communication Assessment Protocol for Children
Authors:
Mary Kay Therres, MSMed El, Winters, CA.
Abstract:
Introduction: Assessment is fundamental to working with children who have hearing loss. Accurate diagnosis is crucial to their outcomes. Geers, Nicholas, Tobey, and Davidson, (2016) research demonstrates this well. They concluded that "language delay persisting beyond the preschool years is highly predictive of poor reading and academic outcomes; therefore, current assessment methods must validly expose any pertinent linguistic deficits." To obtain the most accurate determination of a child's communication, a combination of formal and informal assessment that examines a variety of areas is essential. A vocabulary test alone will not provide information about a child's morphosyntax, narrative, pragmatics, verbal reasoning, etc. Children with hearing loss exhibit intralinguistic variability and therefore, all aspects of communication must be measured. A battery of tests is necessary to determine a child's full capabilities. As the goal is for children to be educated in an inclusive classroom, use of standardized tests normed on hearing children has become standard practice. In combination with these formal tests, informal assessment provides additional detailed information. Finally, tests that are designed for children with hearing loss help complete the battery that can provide a more complete picture of a child's communication.
Methods: Determining what to assess, what is available, and how often can be erratic and time consuming. In order to organize decisions regarding assessment, decision trees will be reviewed. This presentation will describe a succession of formal, informal, and hearing loss specific tests for children that should be part of every evaluator's assessment tool kit. It will walk the participants through the development of a decision tree that outlines the areas in audition, receptive language, and expressive language that should be evaluated along with resources that may be used at each branch of the tree.
Results: The aim is for participants to be able to develop their own decision tree/protocol along with a list of assessment resources. Professionals will be able to then develop their own tool kit of assessment resources to provide consistency and efficiency in their practice.
Conclusion: A standardized test by itself is not sufficient to identify a child's complete communication profile. Unfortunately, a child may be denied services due to results of minimal testing. A battery of tests that evaluate all aspects of a child's communication should be part of every professional's repertoire of resources. Utilizing these resources will then ensure a child will receive the necessary support to maximize his/her potential for acquiring language. Participants will be able to identify assessment resources they currently have and resources they may want to add to their tool kit. Understanding what to assess, what resources are available, and when to use them will not only better serve the child but will also aid the professional in streamlining their evaluation practices.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-1: Understanding Pediatric Outcomes
Abstract ID: 184
Title: Parent-Child Interaction Therapy: Outcomes of a Family-Based Intervention Targeting Language, Behavior, and Maternal Sensitivity
Authors:
Elizabeth B. Adams Costa, PhD 1, Lori Day, Ph.D. 2, Colleen Caverly, M.A. 1, Nancy Mellon, M.S. 3, Meredith Ouellette, M.S. 4, Dorothy White, M.A. 1; 1Department of Psychology, The River Sch./RiverREACH Clinic, Washington, DC, 2Department of Psychology, Gallaudet Univ., Washington, DC, 3Head of School, The River Sch./RiverREACH Clinic, Washington, DC, 4The River Sch./RiverREACH Clinic, Washington, DC.
Abstract:
Introduction: Parents generally serve as primary language models for their children. A child's diagnosis of hearing loss, however, often disrupts the dynamic parent-child language interaction (Young & Tattersall, 2007). Although families selecting spoken language for their children can still serve as native language models, disparities in child outcomes suggest that parents need assistance in establishing an accessible, language-rich environment at home. Recent studies suggest that adding maternal sensitivity training to early intervention programs may significantly improve child language outcomes. Maternal sensitivity has been found to predict significant increases in language growth for children with cochlear implants. In fact, linguistic stimulation for the child was only related to language growth in the context of high maternal sensitivity (Quittner et al, 2013). Notably, the effects of maternal sensitivity were similar to the effects found for age of implantation, which has long been considered one of the most powerful predictors of child outcomes. Parent-Child Interaction Therapy (PCIT) is a 16-22 week parent interaction-training program and behavioral intervention in which a therapist coaches parent-child dyads in order to promote child development. Parents are taught skills they can apply at home to promote child language, establish a nurturing and secure relationship, and increase prosocial behavior. The current study evaluated the effectiveness of PCIT as a psychosocial and behavioral intervention for families of children with hearing loss, examined its applicability as a language intervention, and assessed the impact on maternal sensitivity.
Methods: PCIT was evaluated for parent participants who had children with hearing loss (N=17), examining both parent's indirect language stimulation, and changes in child behavior as a result of treatment. For a subset of the treatment group (N=6), pre- and post-treatment child language samples were compared to matched controls who did not receive PCIT. Structured interactions were videotaped and coded on constructs of maternal sensitivity by a clinician blind to the intervention groups using the Parent-Child Interaction System (PARCHISY).
Results: The frequency of optimal parental language input was significantly higher post-treatment (Mdn= 34) than pre-treatment (Mdn = 5), $p < .01$. Parent report of problematic behavior on a standardized measure was significantly lower post-treatment (Mdn = 85) than pre-treatment (Mdn = 121), $p = .01$. The change in Mean Length of Utterance from pre- to post-treatm ent for the PCIT group (Mdn = .96) was significantly different than the change for matched controls (Mdn = .26), $p < .05$. In terms of maternal sensitivity, the treatment group demonstrated significant improvements in constructs related to maternal sensitivity (i.e., increased parent positive content, child responsiveness to parent, dyadic cooperation, parent positive affect, and decreased parent negative affect) as coded by the PARCHISY system, compared to controls.
Conclusion: This study suggests that PCIT is a promising intervention to facilitate parent-child communication as it promotes optimal indirect language stimulation, improves parent-child interaction, increases maternal sensitivity, and ultimately increases spoken language skills for children.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-1: Understanding Pediatric Outcomes
Abstract ID: 248
Title: Association between Communication Mode before Cochlear Implantation and Longitudinal Spoken Language Development after Implantation: The Childhood Development after Cochlear Implantation Study

Authors:
Nae-Yuh Wang, PhD 1, Ann Geers, PhD 2, Andrea Warner-Czyz, PhD 2, Christine Mitchell, ScM 1, Laurie Eisenberg, PhD 3; 1Welch Ctr. for Prevention, Epidemiology, and Clinical Res., Johns Hopkins Univ., Baltimore, MD, 2Callier Ctr. for Communication Disorders, Univ. of Texas at Dallas, Dallas, TX, 3USC Caruso Family Ctr. for Childhood Communication, Keck Sch. of Med. of the Univ. of Southern California, Los Angles, CA.

Abstract:
Introduction: Most hearing parents of young children born with severe to profound sensorineural hearing loss wish their children to acquire spoken language. A key question parents face after the diagnosis of hearing loss is to identify a habilitation program that will facilitate subsequent language development while contemplating treatment options such as cochlear implantation. We studied this question using longitudinal data collected through a multicenter study evaluating childhood development after cochlear implantation.
Methods: Using parent-reported communication modes in habilitation settings from baseline assessments before cochlear implantation (CI), we classified young CI candidates (mean age 26 months) into 5 subgroups: American Sign Language (ASL) only (N=42); auditory-verbal, auditory-oral, or cued speech only (ORAL, N=63); concurrent ORAL and ASL (N=47); ORAL and non-ASL signs or total communication (N=19); and no reported habilitation or use of gestures only (N=16). We tracked their spoken language development over 8 years post-CI via the Reynell Developmental Language Scales from baseline to the 3 rd post-CI annual follow-up, and the Comprehensive Assessment of Spoken Language annually thereafter. Core composite standard score based on age appropriate core tests through the 8 th year follow-up served as the primary outcome for analysis. Age at CI activation, family income, and cognitive screening, speech perception, and maternal sensitivity scores at baseline were accounted for in a mixed-effects regression model.
Results: After multivariable adjustment, the 5 subgroups demonstrated different longitudinal trajectories in spoken language development (p=0.02). The ORAL only (group 2) gained 1.2 points/year faster (p=0.0037) and the ORAL + non-ASL sign (group 4) gained 1.5 points/year faster (p=0.0105) in core composite standard score over 8 years post CI when compared to the ASL only (group 1). Group 3 (ORAL + ASL) and group 5 (no reported habilitation or use of gestures only) were estimated to each have 0.6 points/year faster gain than group 1 but these comparisons were not statistically significant.
Conclusion: Enrollment into an ASL only habilitation setting before CI was associated with a slower rate of spoken language development post CI in comparison to other communication settings, even after accounting for key predictors of the outcome. These findings suggest that enrollment into habilitation settings with ASL alone or in conjunction with other communication settings before CI do not result in faster rates of spoken language development post CI.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-1: Understanding Pediatric Outcomes
Abstract ID: 91
Title: Demistifying Early Hearing Detection and Intervention (EDHI) CDC National Data
Authors:
Linda A. Hazard, Ed.D 1, Anita Jeyakumar, MD 2; 1VTEHDI, Vermont Dept. of Health/UVM Med. Ctr., Burlington, VT, 2Carilon Clinic, Roanoke, VA.
Abstract:
Introduction: The goals of EHDI programs are to ensure compliance with the Joint Commission on Infant Hearing (JCIH) national standards that all infants are to receive a hearing screening by 1 month of age, diagnosis of hearing loss by 3 months of age and entrance into early intervention services by 6 months of age. Most EHDI programs are funded in the United States and Territories through two federal grants: Health Resources Services Administration (HRSA) and the Center for Disease Control (CDC). The majority of states and territories report hearing screening, diagnosis and intervention data to the CDC annually. There are many challenges faced by EHDI programs and one of the challenges is in the interpretation and comparison of the annual survey data between EHDI programs. CDC and EHDI Coordinators have been working collaboratively to identify areas of improvement both in the display of the data, comparisons between states/territories and the compliance to 1, 3,6.
Methods: National EDHI data (year 2015 available 11/2017 and preliminary 2016 data) will be reviewed for compliance with 1-3-6. Trends in regional and state/territory-specific rates for loss to follow-up (LTFU), diagnosis and early intervention, plus missed babies will be evaluated and comparisons made between states and territories.
Results: More than 96% of infants receive a hearing screening by 1 month of age. EHDI programs are currently focused on improving the number of infants diagnosed by 3 months of age and ensuring entrance into early intervention by 6 months of age. Understanding the CDC annual survey data and encouraging programs to track current data is essential for identifying gaps and quality improvement initiatives to reduce loss to follow-up and decrease the number of missed babies. Data will be displayed showing opportunities and challenges for EHDI programs.
Conclusion: Although substantial gains have been made in EHDI programs for screening, diagnosis and early intervention there are still challenges in meeting the 1,3,6 goals. Integrated data systems within states/territories including vital records, standardized protocols and reporting of EHDI data are essential in reducing LTFU and delays in timely diagnosis and appropriate interventions.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-1: Understanding Pediatric Outcomes
Abstract ID: 400
Title: The Power and Potential of Big Data
Authors:
Jedidiah J. Grisel, MD, Auditory Implant Initiative; Erin Schafer, Ph.D., University of North Texas; Terry Griffin, Ph.D. Midwestern State University; Justin Golub, MD, MS, Columbia University College of Physicians and Surgeons; Rahul K. Sharma, M.D. Candidate, Columbia University College of Physicians
Abstract:
If we are to improve cochlear implant utilization for children and adults, it is critical that we understand outcomes and develop standards for candidacy testing, recipient selection and post-implant management. Unfortunately, current literature exists in silos, and sample sizes obtained at any single institution are too low to have a meaningful impact on the industry as a whole. This presentation will explore aggregate data from 33 implant centers in the United States tracking outcomes on approximately 2300 cochlear implant recipients (pediatrics and adults). Pre-operative, peri-operative and post-operative data will be presented both for surgical and audiometric domains. In initial research studies, the database was used to evaluate outcomes in older adults, develop biostatistical tools to interconvert outcome measures, and determine candidacy for implantation using a software-based screening tool. Future research will examine outcomes in adults and children as a function of payer status, assess the potential impact of the software-based screening for implant candidacy across multiple clinics, and develop predictive models for expected outcomes following implantation in adults and children. Only by understanding current trends and outcomes can we progress to developing standards of care for individuals who are candidates or recipients of cochlear implants.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-2: Adult Cognition / Outcomes
Abstract ID: 48
Title: Cognitive and Demographic Predictors of Cochlear Implant Outcomes in Adults with Cochlear Implants
Authors:
Aaron C. Moberly, MD 1, Michael S. Harris, MD 2, David B. Pisoni, PhD 3; 1Otolaryngology, The Ohio State Univ., Columbus, OH, 2Otolaryngology, Med. Coll. of Wisconsin, Milwaukee, WI, 3Psychology, Indiana Universitty, Bloomington, IN.
Abstract:
Introduction: Significant variability in speech recognition persists among postlingually deafened adults with cochlear implants (CIs). Neurocognitive functions, such as working memory capacity, information processing speed, and inhibition-concentration, have been identified as contributors to speech recognition in adults with hearing loss. This study examined neurocognitive factors and demographic factors in adult CI candidates, and related these assessments to speech recognition outcomes 6 months after implantation.
Methods: Fifteen adult, postlingually deaf CI candidates were tested using a battery of non-auditory neurocognitive measures prior to implantation, along with assessments of hearing history, socioeconomic status, and reading ability. Neurocognitive measures included working memory capacity, information processing speed, inhibitory control, and nonverbal reasoning. Scores on these assessments were examined as predictors of sentence recognition abilities (using IEEE and PRESTO sentences) 6 months after cochlear implantation.
Results: Scores of sentence recognition were significantly predicted by scores of reading ability, information processing speed, and nonverbal reasoning.
Conclusion: Findings provide further evidence that non-auditory neurocognitive and demographic measures can predict speech recognition outcomes preoperatively for CI candidates. Results provide the basis for continued work to develop a comprehensive pre-operative battery to prognosticate speech recognition outcomes for adult patients considering cochlear implantation.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-2: Adult Cognition / Outcomes
Abstract ID: 84
Title: The Effect of Cochlear Implants on Cognitive Function in Older Adults: Prospective Longitudinal Study Preliminary Results
Authors:
Julia Sarant, PhD, Medicine 1, David Harris, PhD, Econometrics 2, Richard Dowell, Phd, Medicine 1, Peter Busby, PhD, Medicine 3, Paul Maruff, PhD, Psychology 4, Adrian Schembri, PhD, Psychology 4, Robert Briggs, MBBS, FRACS 1, Lisa Bennet, Masters of Speech Pathology 1, Manasi Canagasabey, Masters of Audiology 1, Agnes Au, PhD 5; 1Audiology & Speech Pathology, The Univ. of Melbourne, Melbourne, Australia, 2Economics, The Univ. of Melbourne, Melbourne, Australia, 3Cochlear Ltd, Melbourne, Australia, 4CogState Ltd, Melbourne, Australia, 5Audiology & Speech Pathology, The Univ. of Melbourne, The University of Melbourne, Australia.
Abstract:
Introduction: Hearing loss has been found to be independently associated with the rate of cognitive decline in older adults, with an accelerated rate of cognitive decline for those with hearing loss. Although there are successful treatments for hearing loss such as cochlear implants (CIs), there is no successful treatment for the cognitive decline that often occurs with ageing. It is therefore important to investigate whether remediation of hearing loss could delay the onset of cognitive impairment. This new longitudinal study is investigating the relationships between: 1. Degree of hearing loss and rate/extent of cognitive decline 2. Success with CIs and post-operative cognitive change 3. CI outcomes and change in quality of life across a variety of measures
Methods: Participants are being recruited over the first 3.5 years of the study and are assessed pre and every 18 months post CI, and cognitive and other outcomes compared with those of a control group from a comparable cohort study of older adults with normal hearing. Pre and post-operative outcomes include cognitive function, hearing, speech perception, quality of life (QOL), activity, diet, loneliness and isolation, anxiety, depression, medical health and biomarkers.
Results: Initial results for 45 adults, aged 61-88 years with mean PTA 75dB are presented. Executive function was significantly negatively correlated with increased hearing loss (-0.42, p=0.006). Controlling for age, gender, cardiovascular conditions, education, and whether participants were working or retired, multiple linear regression showed PTA was a significant predictor of executive function (p=0.024), contributing 13% to the overall variance. Marginal effects analysis showed an additional 10dB of hearing loss predicted a reduced mean executive function score by 0.284, or 23% of the SD on this measure. Having one or more cardiovascular condition was significantly negatively correlated with decreased visual learning function (-0.17; p=0.021), and lower self-reported QOL scores were also significantly negatively correlated with visual attention performance (-0.32, p=0.037).
Conclusion: Despite the small initial sample size, hearing loss, cardiovascular disease and QOL were found to be correlated with significantly poorer cognitive function at baseline. Follow up over 5 years will reveal the effects of intervention with CIs on all outcomes, and whether this intervention can delay or slow the onset of cognitive decline. Further updated data will be provided in this presentation.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-2: Adult Cognition / Outcomes
Abstract ID: 180
Title: Device Statistics and Speech Recognition Performance in Older Cochlear Implant Recipients
Authors:
Kara C. Schvartz-Leyzac, AuD, PhD, Chelsea A. Conrad, AuD, Teresa A. Zwolan, PhD;Otolaryngology- Head & Neck Surgery, Univ. of Michigan, Ann Arbor, MI.
Abstract:
Introduction: Cochlear implants are proven to be successful and effective in adults of all ages, including older adults. However, there is reason to suspect that older listeners' listening environments and demands are different than those of younger adults. For example, younger adults may experience a more enriched listening environment compared to their older counterparts. Consequently, these disparate auditory experiences might contribute to speech outcomes.
Methods: The current study is a retrospective project that analyzed the datalogging statistics in adult patients implanted (first ear) since December 2, 2013. Subjects included 189 postlingually deafened adults who ranged in age from 19 to 93 years at time of surgery. All subjects were fitted with "on the ear" or "off the ear" processors in which datalogging statistics are available. We examined how characteristics of device use (e.g., total hours, sound environment, accessory use) differed across the adult age -span in decade increments (ages 19-30, 31-40, 41-50, 51-60, 61-70, 71-80, >80), at various time points that occurred during the first year following activation (including 1 week, 1 month, 3 months, 6 months, and 12 months post-activation). Further, we examined the relationship between average device use at 12 months post-implant and speech recognition outcomes measured at the same test interval.
Results: Preliminary results suggest that, on average, there are several device use characteristics that change with increasing listener age. For example, the average number of total hours that a processor is on is 12.28 in the youngest age group (19-30) and systematically decreases across the age span for an average of 11.54 hours in the oldest age group (>80). Similarly, the youngest listeners spent more hours listening to speech or speech-in-noise (3.48) compared to oldest listeners (2.93). Other trends, such as number of coils off and average environmental loudness (dB) also systematically increased or decreased across the age-span. Further analysis will examine the relationship between device use and speech recognition outcomes.
Conclusion: Datalogging suggests age-related differences in sound environment and listening habits. These results shed light on different auditory experiences of our implant recipients, particularly in the oldest age group. Further analysis will determine if these characteristics relate to postoperative speech recognition scores. If so, the results could serve as a powerful counseling tool for auditory rehabilitation in older adult listeners.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-2: Adult Cognition / Outcomes
Abstract ID: 191
Title: The Relationship Between Device Use and Auditory Environment in Elderly Cochlear Implant Users - Effects of Time and Age

Authors:
Maura Cosetti, MD 1, Jillian Levine, AuD 2, Alex Legcocki, M.D. 1, George Wanna, M.D. 1;
1Otolaryngology, New York Eye & Ear Infirmary of Mount Sinai, New York, NY, 2New York Eye & Ear Infirmary of Mount Sinai, New York, NY.

Abstract:
Introduction: Cochlear implantation is safe and effective in the elderly with well-established benefits in speech perception and quality of life. Many predictors of performance in elderly patients mimic that seen in younger adults, including duration of deafness and device use. There appears, however, to be increased variability in outcomes in the elderly. At the same time, there is increasing information suggesting a relationship between hearing loss and various psychosocial domains including cognition, loneliness, and social isolation. Given that minimal data exists about the natural auditory environment of elderly cochlear implant users it is worthwhile to further explore this in addition to device use trends in this population.
Methods: Retrospective analysis of cochlear implant sound processor data logs for individuals > 65 years of age. Data regarding device use (hours per day) and environmental scene (including speech in quiet, speech in noise, noise, music, and quiet) were extracted and analyzed. Additional variables were created by collapsing the categories of speech in quiet and speech noise (ie Speech) and speech in noise and noise (ie Noise.)
Results: Significant inter-individual variability was found in device use and scene classification. No clear relationship was detected between device use and age with some of the oldest patients demonstrating a large number of hours/day of cochlear implant use. There was a relationship between listening environment and age in which the proportion of time spent in quiet increased with age.
Conclusion: Variables affecting auditory performance in elderly cochlear implant patients are multifactorial and include not only amount of device use, but also exposure to auditory stimuli following implantation. Cochlear implant patients of advanced age spend a greater amount of time in quiet, a factor that may impact speech perception potential in this group. Analysis of individual speech processor data can assist in creating a patient-centered rehabilitative strategy, which should include facilitating access to speech-rich environments for those at greatest risk.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-2: Adult Cognition / Outcomes
Abstract ID: 242
Title: The Effect of Working Memory on the Combined Lexical and Indexical Speech Perception Assessment in Adult Cochlear Implant Users
Authors:
Chad Ruffin, MD, Michael Ye, BS, Jack Burgeson, BS, Ryan Graham, BS, Charles Yates, MD;Department of Otolaryngology, Indiana Univ. Sch. of Med., Indianapolis, IN, IN.
Abstract:
Introduction: The degraded speech of cochlear implants (CIs) is associated with high levels of cognitive load. Users of cochlear implants (CIs) often report that this is manifested as an inability to efficiently process all the cues of speech. To model this, we have previously reported a new outcome measure, the Combined Lexical and Indexical Speech Perception Assessment (CLISPA) that assessed speech perception perception in three conditions: (1) traditional lexical-only perception, (2) indexical-only perception, and (3) combined lexical and indexical perception. The drop in performance in the third, combined condition is hypothesized to be a proxy for cognitive load that is modulated by working memory. The purpose of this study is to test the effect of working memory on the perceptual capacity for lexical and indexical speech cues.
Methods: AzBio Sentence Lists were re-recorded to create CLISPA sentence lists by including emotion and more speakers. The indexical items assessed in CLISPA include the perception of gender, speaker identity, and emotion. These sentences were previously validated in a group of normal hearing listeners (NHLs) under vocoded conditions.CLISPA sentence lists were administered in quiet to a group of post-lingually deafened adults with CIs under three conditions: (1) traditional lexical-only perception, (2) indexical-only perception, and (3) combined lexical and indexical perception. Digit spans of the subjects were collected.
Results: Performance of lexical perception in quiet was near ceiling in this group of CI users.The performance on both lexical and indexical items in the combined condition was significantly worse when compared to baseline performance in lexical-only and indexical-only conditions. Although reaction times were not significantly different than a group of NHLs, the time to complete the self-paced CLISPA task was roughly twice that of NHLs.The performance of digit span backwards was significantly correlated with indexical scores only in the combined lexical and indexical condition.
Conclusion: Performance on both lexical and indexical perception in the combined condition was worse than when these tasks were assessed independently. This phenomenon is persistent even when CI users obtain near maximal scores of speech perception in quiet. CLISPA suggests that CI users have a diminished capacity to perceive both speech and indexical cues in close temporal proximity such as readily performed by NHLs.The performance on combined lexical and indexical performance was positively correlated with working memory.Traditional dual-task measures of cognitive load use separate auditory and visual components. We present CLISPA as a dual-task auditory-only model of holistic speech perception. These findings have important implications for rehabilitating communication even when lexical speech perception is at maximal levels.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-3: Outcomes: Medical Topics
Abstract ID: 143
Title: Can I play ball? A Novel Experimental Model for Impact Testing on Cochlear Implant Devices
Authors:
Alex D. Sweeney, MD 1, Rodrigo Villalta, BS 2, Bing Xu, PhD 3, Cynthia Bir, PhD 2, Kurt Koester, PhD 3; 1Otolaryngology - Head and Neck Surgery, Baylor Coll. of Med., Houston, TX, 2Emergency Medicine, Univ. of Southern California, Los Angeles, CA, 3Advanced Bionics, Valencia, CA.
Abstract:
Introduction: The safety of a cochlear implant during sports participation remains largely unknown, and the paucity of available information on this subject is becoming an increasingly important issue as criteria for implantation expand. Prior research has evaluated the impact resistance of a cochlear implant, though the associated data cannot be easily extrapolated to the everyday activities of an implant user. We sought to design and trial an experimental model of impact testing on cochlear implants that would more accurately simulate the effects of physical trauma to the implant site of a living user.
Methods: Using literature on impact trauma currently utilized by professional sporting associations, an experimental model was designed to measure the effects of direct impact to an implant (no wearable externals). Devices were fixed in the standard postoperative location of a cochlear implant on an instrumented anthropomorphic dummy to simulate real-world sports injury conditions without protective equipment. The devices were covered with a skin and soft-tissue surrogate and were subjected to physical impact trials using sport-specific projectiles (e.g., tennis, baseball, cricket) moving at gameplay-relevant velocities. All trials were recorded using high-speed photography, and all devices were ultimately examined for electrical and hermetic failure.
Results: 23 devices were used in 67 experimental trials. No failures were observed below professional level velocities. Moreover, failures were only observed for baseballs with a velocity of approximately 96 mph and cricket balls at >80 mph, which are consistent with the top echelons of professional play. Comparisons between experimental projectile velocities and Head Injury Criterion in the present study and sports injury literature suggest that implant damage may be a consideration for recipients participating in some of the aforementioned activities, but damage would likely occur after the threshold for other injuries is exceeded.
Conclusion: The proposed model for assessing impact trauma to cochlear implants permits a more realistic correlation with real-life scenarios than previously reported models. These experiments intentionally included projectile velocities that would be consistent with world-class professional play under worst-case conditions (e.g., helmetless). Although implant failure due to physical trauma should be considered by users who participate in sports activities, the current work indicates the risk during amateur play may be low relative to other injuries, and this risk would be further reduced by protective equipment. However, future trials will attempt to establish more precise recommendations on the basis of patient- and sport-specific variables.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-3: Outcomes: Medical Topics
Abstract ID: 250
Title: Longterm Use of the Auditory Brainstem Implant in Non NF2 Children
Authors:
Ranjith Rajeswaran, MASLP 1, Mohan Kameswaran, MS., FRCS., MAMS., DSc., 2, Vasudevan M C, MBBS., MS 3, Ramla Ismail, BASLP 1; 1Audiology and Speech Language Pathology, MERF-Inatitute of Speech and Hearing, Chennai, India, 2Surgery, Madras ENT Res. Fndn. (P) Ltd.,, Chennai, India, 3Neuro Surgery, Madras ENT Res. Fndn. (P) Ltd.,, Chennai, India.
Abstract:
Introduction: Auditory brainstem implants are the only treatment option for patients who suffer from cochlear or retrocochlear hearing loss which cannot be treated with a cochlear implant. ABI performed routinely in adults and children who are not candidates for CI. More and more children are identified as candidates for Auditory Brainstem Implant (ABI), Non-NF2 patients often have better outcomes after ABI surgery than patients suffering from NF2. Research shows non-NF2 children appear to be good candidates for ABI implantation (Colletti et al., 2006 and 2009; Grayeli et al., 2008). However there is clear evidence to predict outcomes in these children. Though there are few articles that describe the outcomes in children with ABI, only very few studies have documented the long-term results and use of the device in these children. This study will shed some light about the long-term outcomes in children with ABI.
Methods: Ten children with Auditory Brainstem Implant were monitored for a period of two years. Their listening, Speech and Language outcomes were measured periodically at pre-operative, first fitting, 3, 12,18 and 24 months post fitting using MED-EL EARS Test Battery • LittlEars Auditory Questionnaire (LEAQ) • Categories of Auditory Perception (CAP) Rating Scale • Speech Intelligibility (SIR) Rating Scale • Detection/Recognition of Ling Sounds • Checklist of Auditory Communication Skills • Determination of communication mode
Results: Significant improvement in scores was found in all categories at 24months compared to pre-operative scores. No significant improvements found in overall intervals. Little Ears Test scores increased but slower and with a lower plateau than for children wearing a CI. Noteworthy, some children indeed reached test scores close to the CI children. While all children communicated with total communication and sign language prior to ABI switch-on, this changed during the course of the study and all children used oral and sign language at the 24 months follow-up. In most subjects all channels could be activated and also stayed activated throughout the study. Out of four children with adverse event, three resolved and one child died due to non-device related issue.
Conclusion: ABI is option to restore hearing in children who are contra indicated for CI. Outcomes are variable in children with ABI and are not comparable to CI, However some children reached LEAQ and EARs test scores comparable to CI children. Low rate of device or procedure related events were observed. ABI surgery is a safe and effective treatment in children with hearing impairment who are not CI candidates.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-3: Outcomes: Medical Topics
Abstract ID: 114
Title: Can We Predict the Outcome of a Cochlear Implant with an Intraoperative Intracochlear Test Electrode?
Authors:
Luis Lassaletta, MD 1, Miryam Calvino, MD 2, Isabel Varela Nieto, MD 3, Javier Gavilan, MD 4; 1Otolaryngology, La Paz Univ. Hosp.. IdiPAZ. CIBERER., Madrid, Spain, 2Otolaryngology, La Paz Univ. Hosp.. IdiPAZ, Madrid, Spain, 3Instituto de Investigaciones Biomedicas Alberto Sols. CIBERER, Madrid, Spain, 4Otolaryngology, La Paz Univ. Hosp., Madrid, Spain.
Abstract:
Can we predict the outcome of a CI with an intraoperative intracochlear test electrode?
Introduction: Cochlear implantation requires that the auditory nerve remains intact for hearing perception. In certain cases, such as the presence of tumors of the VIII nerve or aplasia/hypoplasia of the cochlear nerve, it may be necessary to assess the viability of the cochlear nerve in order to predict the outcome of a cochlear implantation. The aim of this study was to assess the integrity and the functionality of the auditory nerve in standard cochlear implantees by using an intracochlear test electrode, and to compare electrical auditory brainstem responses (eABR) via the test electrode with the eABR responses with the cochlear implant (CI).
Methods: Ten postlingually deaf subjects (age at implantation 55 years, range 19 - 72) were subsequently implanted with a MED-EL Concerto CI on the side without any useful residual hearing. Following identification of the round window via posterior tympanotomy, the test electrode was inserted in the cochlea previous to cochlear implantation. To assess the quality of an eABR waveform, scoring criteria from Walton et al., 2008 were chosen. The waveforms in each session were classified by detecting waves III and V by the algorithm and visual assessment of the waveform. The speech performance was evaluated with monosyllables, disyllables and sentence recognition tests.
Results: In all 10 patients responses to electrical stimulation could be evoked. Five different eABR conditions were recorded from each subject. With the TE, two monopolar and one bipolar intra-cochlear condition were tested. With the CI, two monopolar conditions were tested. In all cases both the test electrode and the CI elicited responses and there were no statistical differences in latencies or amplitudes after stimulation with the test electrode or CI. All patients obtained useful hearing by their CI and are using their implants daily.
Conclusions: The intracochlear test electrode may be a suitable method to test the integrity of the auditory nerve by recording eABR signals. This allows for further research on the status of the auditory nerve after tumor removal and correlation with auditory performance. In selected patients, this may allow for cochlear implantation as an alternative to ABI.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-3: Outcomes: Medical Topics
Abstract ID: 185
Title: AAMI CI86 Cochlear Implant Systems: Requirements for Safety, Functional Verification, Labeling and Reliability Reporting -An Inside Look from FDA's Perspective
Authors:
William Regnault, PhD, Vasant Dasika, Ph.D.;Food and Drug Administrarion, Silver Spring, MD.
Abstract:
Introduction: A U.S. standard for cochlear implant systems, AAMI/CI86 Cochlear Implant Systems: Requirements for Safety, Functional Verification, Labeling and Reliability Reporting has been published by the American Association for Medical Instrumentation (AAMI). The standard establishes acceptable design and testing requirements as well as statistically- and/or analytically-based performance and reliability testing methods for cochlear implant systems. Both implantable and external components are covered including electrodes, stimulators, sound processors, batteries, system accessories and supporting software.
Methods: Begun in 2010, development of this standard was a collaborative 6-year effort between cochlear implant manufacturers, FDA representatives, surgeons, audiologists, academicians, and members from public/professional organizations.
Results: AAMI/CI86 uniquely combines requirements relating to uniform reliability reporting, appropriate bench testing, labeling, and regulatory submission content. The process of collecting and reporting failure analysis data for the reliability reports to clinicians, cochlear implant users, and regulators has been designed to help promote uniformity in the failure-analysis steps undertaken across CI product lines and between manufacturers. Use of the logic outlined in this standard will result in reports of device explantation rates, stratified by explant type (i.e., medical related, device failure, or inconclusive failure analysis) and patient age. The standard specifies that CI manufacturers who choose to comply with the requirements of this standard will make publicly available device data sheets for the implantable device, electrode array, sound processing strategies, sound processor hardware, and, if applicable, remote controls. Providing information on this common set of device system components should allow more transparent comparison between CI models for patients and clinicians. We expect that this will help influence the most appropriate selection of a device for a given patient. AAMI/CI86 specifies several requirements in terms of device verification and validation for complying manufacturers to meet. A statistically- and risk-based sample size methodology is outlined to provide a common set of testing protocols and criteria for manufacturers to use to support device approval.
Conclusion: It is expected that this standard will be widely adopted by manufacturers. Thus, clinicians and users will have information to make better informed decisions about device selection through uniform and transparent public reporting of reliability information and device specifications. The broad verification and validation requirements based on a common statistically risk-based approach are expected to contribute to the next generation of safe and effective cochlear implant devices.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S3-3: Outcomes: Medical Topics
Abstract ID: 187
Title: AAMI CI86 Cochlear Implant Systems: Requirements for Safety, Functional Verification, Labeling and Reliability Reporting - Overview & Regulatory Implications from FDA's Perspective
Authors:
Vasant Dasika, PhD, William Regnault, Ph.D.;US FDA, Silver Spring, MD.
Abstract:
Introduction: A U.S. standard for cochlear implant systems, ANSI/AAMI CI86 Cochlear Implant Systems: Requirements for Safety, Functional Verification, Labeling and Reliability Reporting has been published. This standard incorporates a total product lifecycle (TPLC) perspective by combining premarket requirements with post-market reliability monitoring, ultimately aimed at improving future designs. The Center for Devices and Radiological Health (CDRH) at the U.S. Food and Drug Administration (FDA) employs a total product lifecycle (TPLC) perspective in medical device regulation. The aim of AAMI CI86 is to codify in a single document requirements for uniform public reporting of device reliability and specifications; device design parameters relating to electrical, mechanical, and environmental safety; bench verification and validation testing; and regulatory submission content. To our knowledge, these areas have been unaddressed, addressed in less detail, or addressed separately by existing national/international standards for medical devices.
Methods: The AAMI Cochlear Implant Committee was formed in 2010 following submission of a work item proposal by FDA to the American Association for Medical Instrumentation (AAMI). This committee includes representatives of four cochlear implant manufacturers, FDA representatives, surgeons, audiologists, academicians, and members from professional organizations. AAMI CI86 was developed by the Committee between 2010 and 2016 during numerous collaborative face-to-face meetings and teleconferences.
Results: AAMI CI86 was published in 2017. The standard establishes acceptable design and testing requirements for devices, and requires public reporting of device reliability and device specifications, and regulatory submission content. Based on the Committee's collective experience and individual stakeholder needs, AAMI CI86 specifies a set of requirements to help ensure that a cochlear implant device model will operate as intended over its lifetime. Manufacturers who choose to comply will submit high-quality, scientifically-supported marketing applications to regulatory bodies. Also, more uniform and transparent public reporting will result on the rate of device explantations.
Conclusion: FDA expects that manufacturer compliance to AAMI CI86 will lead to the following: 1) Increased regulatory certainty for manufacturers leading to shorter time to market for new devices and device innovations, 2) Patients and clinicians will select devices based increasingly on uniform transparent science-based information on device specifications and device reliability, and 3) Manufacturers would in turn, innovate and compete with each other, and ultimately bring to market devices which would benefit patients more quickly.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-1: Evaluating Outcomes
Abstract ID: 223
Title: Stakeholder Input Identifies Barriers to and Strategies for Enhancing Functionality and Quality Experiences for Cochlear Implant Users in Complex Listening Situations Involving Music
Authors:
Kate E. Gfeller, PhD, Adam Schwalje, MD, DMA, Virginia D. Driscoll, MA;Otolaryngology-Head and Neck Surgery, Univ. of Iowa Hosp. and Clinics, Iowa City, IA.
Abstract:
Introduction: Music is associated with quality of life, and is often used for ambience in social situations. Unfortunately, cochlear implants (CI) are not technically well suited for conveying key structural elements of music. Prior research has documented 2 problems: (a) poor perception and appraisal in music listening, and (b) poor speech recognition in ambient music (e.g., MUZAK) which functions as background noise. Because both of these listening conditions often involve complex acoustic signals, and fine structure is central to perceptual accuracy and appreciation, we refer to these collectively as complex listening involving music. To date, most studies examining complex listening with music have been in controlled laboratory settings, and emphasized hypothesized benefits from technological manipulations; only modest benefits resulting from technological upgrades have been reported. From our scoping review of over 5000 studies on CI users and complex listening situations, only 43 studies (19.4%) investigated training or approaches other than manipulations of technology. Even fewer studies have sought the input of CI users regarding these problems. Interestingly, there is considerable variability among CI users who have similar hearing history and devices, with some thriving in complex listening environments. What real-life experiences contribute to this variability? Can training or strategic accommodations optimize complex listening with music? This presentation investigates factors that impact complex listening with music based upon rich qualitative data gathered from groups of patients and their families who are stakeholders in CI benefit.
Methods: Using patient-centered research approaches, we sought input from stakeholders in CI use (44 pediatric patients over 18 years; 40 adult patients, family members) regarding complex listening with music. CI users from research registries or support groups and their families were invited to participate in online focus groups organized by onset of hearing loss and age at implantation. Open-ended questions, developed with the input of stakeholders focused on real-life complex listening situations. Responses of focus groups members were evaluated using a comparative analytical approach for thematic content.
Results: Themes revealed differences in satisfaction and quality of experience, rehabilitation experiences, motivation to seek solutions or resources, situations in which music listening was most and least successful, circumstances in which background music posed the greatest challenge to spoken conversation, impediments to rehabilitation (e.g., lack of reimbursement, resources), and parameters of training most desirable and compatible with the demands of real life.
Conclusion: Information derived from focus groups of CI users indicates possible directions for enhancing CI benefit for complex listening involving music and can guide future research regarding meaningful and practical rehabilitation for enhancing music-based listening experiences.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-1: Evaluating Outcomes
Abstract ID: 186
Title: Pediatric Cochlear Implant Use: An Analysis of Datalogging and Usage Statistics During the First Year Following Activation
Authors:
Chelsea A. Conrad, AuD 1, Kara Schvartz-Leyzac, Au.D., Ph.D. 1, Teresa A. Zwolan, Ph.D. 2; 1Univ. of Michigan, Ann Arbor, MI, 2Cochlear Implant Program, Univ. of Michigan, Ann Arbor, MI.
Abstract:
Introduction: Consistent device use is often identified as a key factor that positively influences outcomes in pediatric cochlear implant listeners. However, basic information about the progression of device use over time is still unknown, such as the number of hours children typically use their device, the average amount of time that children are exposed to speech when wearing the device, and the average number of times consistent sound is interrupted such as when the coil falls off. Datalogging technology has made it possible to obtain information regarding average device use, including the categories and amount of sounds to which patients are exposed over time.
Methods: This study examined the device use characteristics for 116 newly implanted children who received a cochlear implant at a large implant center between 12/05/2013 and 05/31/2017. Subjects ranged in age from 12 months to 15 years at the time of activation and included 61 males and 50 females. Forty-one children were bilateral implant users, resulting in 157 ears for analysis. Eighty-nine children utilized an “on-the-ear” processor at the time of activation while 14 children utilized an “off-the-ear” processor at the time of activation. Seven children changed the type of processor during the first year of device use. Datalogging information was extracted for all children at each visit that occurred during their first year of device use. This information was analyzed to determine the average amount of time that children used their device 1 week, 1 month, and 3, 6, and 12 months post-activation.
Results: On average, children of all ages use their speech processor about 8.12 hours daily with 1.35 hours of speech and 2.30 hours of speech in noise identified by the scene analysis algorithm. The coil fell off approximately 50 times each day. These data were further assessed to determine patterns of device use, scene detection, and the number of coil offs in relationship to the patient's age at implantation and type of processor used. A comparison of how these statistics change over the first year of device use was made. Finally, these datalogs were evaluated to determine if there was a relationship between device use and the child’s communication mode or participation in weekly auditory-verbal therapy.
Conclusion: Understanding how cochlear implant speech processors are used and the types or amount of inputs that may lead to improved speech understanding can guide clinicians to not only counsel patients and their families regarding consistent device use but to also emphasize the need for quality input during the time these devices are in use. This information may aid in post-operative management of cochlear implant patients and offer some insights into the variability seen in post-operative outcomes.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-1: Evaluating Outcomes
Abstract ID: 264
Title: Recognition of Facial Expressions by Adolescents with Cochlear Implants and Typical Hearing
Authors:
Andrea Warner-Czyz, PhD 1, Julia L. Evans, Ph.D. 1, Lyn S. Turkstra, Ph.D. 2, Meredith Scheppele, B.S. 1, Chen Song, B.S. 1, Delaney Evans, B.A. 1; 1Communication Sciences and Disorders, The Univ. of Texas at Dallas, Dallas, TX, 2McMaster Univ., Hamilton, Canada.
Abstract:
Introduction: Adolescents with severe to profound hearing loss using a cochlear implant (CI) experience significantly more peer problems and higher bullying rates than peers with typical hearing (TH), which may stem from deficits in peer social dynamics. Successful social dynamics require perception of not only of message content, but also integration of sensory input to infer a speaker's emotion from visual (e.g., facial expressions, body language) and auditory cues (e.g., prosody). Some studies suggest no effect of auditory status on discrimination and recognition of facial expressions, but others indicate poorer performance for relative to TH peers. This study examines visual emotion recognition in adolescents with CIs and TH peers to determine if auditory status and emotion type influence accuracy, reaction time, and fixation locations on a face.
Methods: Participants included 34 adolescents with CIs and 24 with TH. CI users had a mean chronologic age of 13.3 years (SD = 2.2 years), mean age at first CI of 2.7 years (SD = 1.9 years), and mean duration of CI use of 10.7 years (SD = 2.2 years). All communicated via oral communication. Adolescents with TH had a mean chronologic age of 13.7 years (SD = 2.5 years). All participants completed an emotion recognition task in which they viewed 24 static images of 4 individuals expressing 6 emotions (anger, disgust, fear, happy, sad, surprise). Participants labeled the emotion projected in the image from a closed-set list. We recorded mouse clicks to examine behavioral accuracy and reaction time, as well as eye movement patterns via an SMI RED250 mobile eye tracker
Results: Results showed no significant group difference (CI vs. TH) in behavioral accuracy or reaction time of facial expressions. However, eye tracking revealed differences relative to areas of the face on which each group fixated, with the CI group fixating longer on the mouth area across emotions compared to TH peers.
Conclusion: Fixating longer on the mouth, which may represent a compensatory strategy to mitigate effects of a compromised signal from the CI, detracts attention from the eyes, which serve a central role in conversation management and peer social dynamics. Knowledge of the effect of CI on emotion recognition could lead to more effective and efficient therapeutic intervention related to social deficits in adolescents with CI.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-1: Evaluating Outcomes
Abstract ID: 265
Title: Improved Perception of Soft Sounds for Cochlear Implant Recipients
Authors:
Amy L. Stein, AuD, Eugene Kim, M.S.E.E., John Norris, DPhil, Leo M. Litvak, Ph.D.;Research and Technology, Advanced Bionics, LLC, Valencia, CA.
Abstract:
Introduction: Perception of soft sounds, particularly soft speech, is important for several reasons: hearing conversations at a distance; understanding soft-spoken individuals; incidental language learning; understanding conversational asides; and reduction in fatigue. 1,2 Cochlear implant (CI) recipients' ability to perceive soft sounds is often determined by the patients' measured threshold responses to tonal stimuli presented in the sound field. Improvements in sound field thresholds have been demonstrated 3,4 when psychophysical threshold (T) levels are raised, therefore mapping soft sounds higher within the electrical dynamic range. However, program manipulations to improve perception of soft sounds can be time-consuming for clinicians and may result in unwanted auditory percepts for CI listeners. In this study, we aimed to improve perception of soft sounds through the application of a noise gate algorithm designed to suppress system noise.
Methods: Subjects were 13 adult cochlear implant recipients; 4 were tested in a bilateral CI configuration and 9 tested in a unilateral CI configuration. Sound field threshold levels and speech perception ability were assessed for three different microphone settings. No other alterations were made to the patient program. Sound field threshold levels were measured using frequency-modulated pure tones at frequencies ranging between 250-6000Hz. Speech perception in quiet was measured at 60 dB SPL and at a softer input level (<- 45 dB SPL). The speech signal was presented from a single speaker at 0^{o} azimuth. Two AzBio sentence lists were presented for each soft level test condition; a single AzBio sentence list was presented for each test condition at 60 dB SPL.
Results: Threshold detection was improved in all microphone settings for all test frequencies for programs utilizing the noise gate algorithm compared to the same programs without the noise gate.Speech understanding was improved for testing at soft input levels for all programs utilizing the noise gate algorithm compared to performance with the same programs without the noise gate setting. Speech performance at 60 dB SPL was equivalent among all program conditions.
Conclusion: Results suggest that use of the noise gate feature allows CI listeners improved access to soft sounds, thereby enhancing speech understanding at softer input levels while not compromising performance at louder levels. Further, this feature may potentially be applied to everyday programs used across a wide range of listening environments and contribute to improved language and literacy skill development for young CI recipients as increased sound awareness and incidental language learning opportunities are provided.
1Holden, L.K., Skinner, M.W., Fourakis, M.S., Holden, T. A. Effect of Increased IIDR in the Nucleus Freedom Cochlear Implant System. J. American Academy of Audiology, 2007; 18: 777-793. 2Madell, J.R. "Evaluating Speech Perception" Pediatric Audiology: Diagnosis, Technology, and Management; Ed. Madell, J.R & Flexer, C. New York: Thieme, 2008. 3Holden, L.K., Reeder, R. M., Firszt, J.B., Finley, C.C. Optimizing the perception of soft speech and speech in noise with the Advanced Bionics cochlear implant system. International Journal of Audiology, 2011; 50: 255-269. 4Baudhuin, J., Cadieux, J., Firszt, J., Reeder, R., Maxson, J. Optimization of Programming Parameters in Children with the Advanced Bionics Cochlear Implant. J. American Academy of Audiology, 2012; 23: 302-312.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-1: Evaluating Outcomes
Abstract ID: 267
Title: The Sequential Dilemma: Factors Affecting Success in Delayed Sequential Implantation in Adolescents
Authors:
Casey Stach, AuD, Heidi Slager, Au.D., Teresa Zwolan, Ph.D.;Univ. of Michigan, Ann Arbor, MI.
Abstract:
INTRODUCTION: Bilateral cochlear implantation is quickly surpassing unilateral implantation as the standard of care for pediatric patients with bilateral severe to profound hearing loss. This trend is likely due to demonstration of improved outcomes with bilateral implant use and an increase in the number of insurers providing coverage for bilateral cochlear implantation. As a result, many children who received a unilateral implant at a young age are now inquiring about receiving a sequential bilateral cochlear implant as an adolescent. Previous studies have suggested that adolescents who receive a sequential bilateral implant experience significant improvement in the second implanted ear, but outcomes vary widely and research on the effect of inter-implant interval has been largely inconclusive. It has been clinically noted that this population is at increased risk for becoming non- or part-time users of their second device. Commonly cited reasons for non-use include poor sound quality and limited speech recognition skills. Conversely, some adolescents perform as well or better with their second implanted ear. This variability in device acceptance, use, and performance makes it difficult for clinicians to counsel families regarding expected outcomes and use with a sequential bilateral CI.
METHODS: This study was a retrospective review of 60 sequentially implanted children at a large tertiary care clinic. Subjects included children who received their first implant between the ages of 1 and 14 years, and their second implant between the ages of 9 and 18 years. Data for both the first and second implanted ears was analyzed, including word and sentence recognition measures. The relationship between speech recognition and utilization of the second cochlear implant will be discussed as a function of several factors including age at implantation of the first ear, age at implantation of the second ear, and time between the first and second implant.
RESULTS: Data was analyzed on 58 patients, as one patient was lost to follow up, and one patient is a non-user of both devices. Results indicated that 29, or 50% of the patients included in this study wear their second implant consistently. The average ages of implantation of the first and second device were similar between the users and non-users, with the average time between the first and second ears at 8 years, 7 months. For those who use their devices consistently, the average monosyllabic word score was 44% with their second ear compared to 80% with their first ear, and the average sentence score was 52% with their second ear, compared to 85% with their first ear. Additional information including whether utilization of amplification in the second ear as well as if etiology of loss prior to implantation affected the decision to use their second implant will be presented.
CONCLUSION: The results of this study will provide valuable data that can be used by clinicians to aid in preoperative counseling of adolescents who are considering a sequential bilateral cochlear implant. Results will also be useful when counseling families about the potential ramifications of delayed sequential bilateral cochlear implantation.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-2: Special Medical Considerations
Abstract ID: 115
Title: Comparison of Electrical Excitation Patterns Associated with Simultaneous Non-adjacent Dual-electrode (up to 4 mm) Stimulation and an Intermediate Physical Electrode
Authors:
Aniket Saoji, PhD 1, Maria Valeria Schmidt Goffi-Gomez, PhD 2, Carina Matinez Rodriguez, MA 3, Leonid Litvak, PhD 3; 1Dept. of Otolaryngology, West Virginia Univ., Morgantown, WV, 2Dept. of Otolaryngology, Univ. of São Paulo Sch. of Med., Sao Paulo, Brazil, 3Advanced Bionics, Valencia, CA.
Abstract:
Introduction: In cochlear implants, an array of intra-cochlear electrodes is used to deliver electrical stimulation to the auditory nerve. In addition to the place-pitch sensation produced by electrical stimulation of individual electrodes, simultaneous stimulation of two electrodes separated by up to 7 mm have been shown to generate pitches intermediate to the physical electrodes. The proportion of current between the two non-adjacent electrodes is known to determine the intermediate place-pitch location. Thus, simultaneous non-adjacent dual-electrode stimulation can be used to compensate for the loss of electrical stimulation from intermediate disabled electrodes. However, simultaneous stimulation of two electrodes separated by a larger spatial distance may produce broader spread of electrical excitation and consequently poorer spectral resolution than that associated with electrical stimulation of intermediate electrodes. Simultaneous stimulation of two electrodes separated by up to 2 mm have been shown to produce electrical excitation patterns like that of an intermediate physical electrode. The present study compares electrical excitation patterns associated with simultaneous stimulation of two electrodes separated by 2, 3, and 4 mm with that associated with electrical stimulation of an intermediate physical electrode.
Methods: A forward masking paradigm was used to measure electrical compound action potentials (ECAPs) for a probe stimulus presented across a subset of electrodes, in the presence of a single or dual-electrode masker. An electrode apical to the dual-electrode stimulus was used as the recording electrode. Electrical excitation patterns for the single and dual-electrode maskers were derived by subtracting the masked response to the probe from the response to the probe in isolation.
Results: Electrical excitation patterns measured for the different masker stimuli were normalized in relation to their peak amplitude of electrical excitation. The normalized patterns were analyzed in terms of their area and center-of-gravity. While individual differences exist between the electrical excitation pattern associated with the different masker stimuli, the results show no significant differences (paired t-test, $p < 0.05$) between the area and center-of-gravity computed from the electrical excitation associated with the single and dual-electrode maskers.
Conclusion: Electrical excitation patterns associated with simultaneous stimulation of two non-adjacent electrodes separated by up to 4 mm is similar to that produced by an intermediate physical electrode. These results suggest that non-adjacent dual-electrode stimulation over 4 mm can be used to compensate for the loss of electrical stimulation produced by disabled intermediate physical electrode/s.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-2: Special Medical Considerations
Abstract ID: 55
Title: Automatic Cochlea Multi-modal Images Segmentation Using Adaptive Stochastic Gradient Descent
Authors:
Ibraheem I. Al-Dhamari, MSc 1, Sabine Bauer, PhD 2, Roland Jacob, PhD 3, Dietrich Paulus, Prof. Computer Vision 1; 1Computer Vision, Koblenz Landau Univ., Koblenz, Germany, 2Sport Science, Koblenz Landau Univ., Koblenz, Germany, 3ENT, Military Hosp. Koblenz, Koblenz, Germany.
Abstract:
Introduction: An automatic segmentation method of cochlea medical images is needed for a good medicalimages analysis. Cochlea segmentation is a challenging problem because of the cochlea's small size and complexstructure. We present a fast and automatic method for cochlea multi-modal images segmentation based onAdaptive Stochastic Gradient Descent Optimizer (ASGD) and Mattes's Mutual Information metric (MMI) inAtlas-base framework. The proposed method, Automatic Cochlea Image Segmentation (ACIS), segments thethree cochlea's scalas i.e scala tympany, scala vestibuli and scala media in about 2 seconds. ACIS and thedataset are available for download as a freeware from a public server.
Methods: The proposed method, Atlas-based Cochlea Image Segmentation (ACIS), is an atlas-based segmentation based on ACIR (Automatic Cochlea Image Registration). ACIR was proposed as a multi-modalcochlea image registration and fusion. It is based on Adaptive Stochastic Gradient Descent Optimizer (ASGD)and Mattes's Mutual Information metric (MMI). The atlas-based segmentation is a segmentation method basedon image registration. There are many ways to do this type of segmentation but the simplest way is to use theresulted registration transformation to transform a segmentation of a high-resolution model to the input imagewhich usually has low-resolution or noise.The atlas-based segmentation is expected to work well when there isa good registration method available for these types of images, see *g. 1.Figure 1: Atlas-based image segmentation concept.
Results: Two important registration parameters are compared, the number of resolutions and the numberof iterations in each resolution. Increasing these two parameters' values a*ects the time required for thesegmentation negatively and does not provide better quality. If the user provides information about the inputimage e.g. ear side and modality, the average required time of the segmentation is reduced to 1.6 seconds withone resolution and 6.5 seconds with 3 resolutions. Using the registration metric value is not a good measurefor the registration or the segmentation quality but it works well to select the suitable atlas for the inputimage in ACIS. In *g. 2 samples of the automatic segmentation results for di*erent modalities are presented.Quantitative results using Dice Coe*cient and Haussdorf will be available in the main script.Figure 2: Samples of automatic segmentation of di*erent modalities
Conclusion: A proposed automatic Atlas-based Cochlea Image Segmentation (ACIS) based on ACIR isproposed and its results are discussed. ACIS provides good results. The segmentation quality is good enoughto get important approximation of cochlea measurements i.e scala tympany length and volume. The averagetime needed for the segmentation is 8 seconds or 1.6 seconds in the case of more information about the side andthe modality being provided.1

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-2: Special Medical Considerations
Abstract ID: 45
Title: Undiagnosed Issues in Children Receiving Cochlear Implants under 12 Months of Age: Prevalence and Implications of "Hidden Disabilities"
Authors:
David Friedmann, MD, Kaitlyn Tona, AuD, J. Thomas Roland, Jr., MD, Susan Waltzman, PhD;Otolaryngology, NYU Sch. of Med., New York, NY.
Abstract:
Introduction: The purpose of this study was to examine a cohort of patients with bilateral severe to profound hearing loss who received cochlear implants (CI) prior to 12 months of age for the incidence and impact of cognitive, behavioral, medical and/or other issues that either arose over subsequent years or were not evident prior to 12 months of age.
Methods: Retrospective chart review of all children implanted under the age of 1 including data from evaluations pre-implant and at least 3 year post-implantation including developmental assessment, medical records and operative reports. Age appropriate testing was utilized. The children were divided into three groups: Group 1 were those with no identified disabilities at time of implantation or later on, Group 2 were those with no known disabilities at time of implantation but diagnosed with additional disabilities following implantation, Group3 had known additional disabilities at time of implantation.
Results: 108 children under the age of 12 months with bilateral severe-to-profound hearing loss were implanted at our center between 2000-2013 with an average age of 9 months at time of implantation. 93 had a minimum of 3 year follow up evaluations post-implantation. The etiologies of hearing loss were as follows: genetic (n=55), anatomic malformations (n=9), meningitis (n=3), CMV (n=3) unknown (n=38). All 93 children obtained auditory and linguistic benefit from implantation and wear their devices on a regular basis. In a vast majority there were no additional issues detected (n=72) through at least 3 years of follow-up. In 11 of the 93, additional issues were known at the time of implantation. 10/93 (9.3%) of the children were diagnosed with additional issues including global developmental delay, attention deficit hyperactive disorder (ADHD), cognitive deficits and autism which were not evident prior to implantation. In the 10 children in which additional disabilities were later diagnosed, all use and receive benefit from their implants. The auditory and linguistic benefits vary and are commensurate with the severity of their disabilities. No statisticalsignificance in outcome was found between Groups 1 and 2 but Group 3 not unexpectedly had poorer outcomes (p=0.05) than either Group 1 or 2.
Conclusions: Children implanted below one year of age but diagnosed with additional disabilities following implantation obtained substantial though varying degrees of benefit from their implants allowing them to maximize their exposure to the auditory world early in development. Ultimate outcomes were related to the degree of their disability. In none of these cases would knowledge of the disability that emerged later have altered the decision to offer cochlear implantation. While this is reassuring in continuing to offer the benefits of early implantation, these cases underlie the importance of addressing these potential issues when counseling families about possible outcomes.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-2: Special Medical Considerations
Abstract ID: 263
Title: Cochlear Implantation in Adults with Single-Sided Deafness: Update from a North American Clinical Trial
Authors:
Nicholas A. Dewyer, MD 1, Kevin Wong, BA 2, Samuel Barber, MD 3, Sullivan Smith, BS 4, Daniel J. Lee, MD 1; 1Otolaryngology, Harvard Med. Sch., Boston, MA, 2Otolaryngology, Boston Univ. Sch. of Med., Boston, MA, 3Otolaryngology, Univ. of Arizona Coll. of Med., Tucson, AZ, 4Tufts Univ. Sch. of Med., Boston, MA.
Abstract:
Introduction: Single-sided deafness (SSD) affects about 60,000 new patients per year in the U.S. and causes impairments in communication, sound localization, and speech perception. Cochlear implantation (CI) is not an FDA-approved treatment option for SSD. In recent years, increasing evidence suggests that CI may improve hearing ability, speech comprehension and sound localization in patients with unilateral hearing loss. SSD CI users also experience tinnitus reduction, an important motivating factor for daily CI use in patients with contralateral normal to near normal hearing. Here we report interim data from our ongoing FDA trial examining the role of CI in the treatment of SSD and tinnitus suppression.
Methods: Our FDA investigational device exemption (IDE) trial is a prospective single-group intervention design. Adults (>18-years-old) with unilateral severe to profound hearing loss for >1 year and an unsuccessful trial of non-invasive hearing devices were eligible for inclusion. Primary outcome measures include sound field thresholds, word recognition, and subjective loudness of tinnitus. Additional measures include tests of sound localization and perception of speech-in-noise.
Results: Between October 2016 and October 2017, 14 adults were screened and six met inclusion criteria. Among the six subjects who underwent CI surgery, the mean duration of unilateral deafness was 2.3 ± 1.9 years. 5 patients had SSD from sudden sensorineural hearing loss, and one after a temporal bone fracture. There were no surgical or postoperative complications. Mean follow-up was 3.7 months. Masked sound field thresholds in the CI ear ranged between 25-50 dB HL with consonant-vowel nucleus-consonant (CNC) word recognition scores in quiet between 26 and 62%. All five subjects reported tinnitus suppression with the CI use.
Conclusions: In this ongoing prospective trial investigating the role of CI in SSD, preliminary data suggest that CI is a viable treatment option that can provide improvements in speech perception, sound localization, and tinnitus.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S4-2: Special Medical Considerations
Abstract ID: 401
Title: Three Challenges for Future Research
Authors:
1Michael S. Harris, MD; 2David B. Pisoni, PhD; 2William G. Kronenberger, PhD; 3Aaron C. Moberly, MD
1. Department of Otolaryngology and Communication Sciences, Medical College of Wisconsin, Milwaukee, WI, 53211, USA 2. Department of Otolaryngology - Head and Neck Surgery, DeVault Otologic Research Laboratory, Indiana University School of Medicine, Indianapolis, IN, 46205, USA 3. Department of Otolaryngology - Head and Neck Surgery, The Ohio State University Wexner Medical Center, Columbus, OH, 43212, USA
Abstract:
The efficacy of cochlear implants (CIs) is well-established in an expanding and increasingly heterogeneous population of children and adults with sensorineural hearing loss. Understanding and explaining the reasons for poor outcomes following cochlear implantation, however, is a persistent problem for clinicians and investigators. We discuss three challenges to guide future research on CIs to better address this pressing issue. First, we consider the overlooked and understudied topic of individual differences and variability in outcomes following implantation. Second, we discuss the lack of reliable pre-implant predictors of outcomes beyond a limited set of demographic and audiological factors. Finally, we consider what to do with a CI user who has a poor outcome. Using these three challenges as objectives for future research on CIs, we suggest that the field needs to adopt a new narrative rooted in theory and methods from Cognitive Hearing Science and information processing theory. Central to this narrative is an understanding and appreciation that hearing loss is not only an ear issue, but also a brain issue, reflecting close links within a functionally integrated information processing system to support robust speech recognition and spoken language processing after implantation.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-1: Team Approach to Maximize Outcomes
Abstract ID: 16
Title: Hearing Preservation After Cochlear Implantation in a Pediatric Population
Authors:
Ashley Grillis, AuD, Victoria Gonzalez, AuD, PhD, Jeff Carron, M.D.;Otolaryngology & Communicative Sciences, Univ. of Mississippi Med. Ctr., Jackson, MS.
Abstract:
Introduction: While residual hearing is often lost after cochlear implantation, preservation of some acoustic hearing is possible. Due to expanding cochlear candidacy and the US Food and Drug approval to include partially deafened adults, attempts to preserve residual hearing have increased. Hearing preservation allows individuals to take advantage of an electro-acoustic stimulation, where lower frequencies are aided through acoustic amplification and the mid/high pitches are aided through the electric stimulation within the same ear. Some techniques to preserve hearing include a "soft surgical" approach and/or a "shortened electrode array". Although the literature is well documented for hearing preservation in the adult population post implantation, there is a shortage of literature regarding the hearing preservation after pediatric cochlear implantation. Brown et. al (2010) demonstrated that hearing preservation using a standard electrode array with full insertion and a modified "soft surgery" protocol is possible in a pediatric population. Ninety percent of children who underwent cochlear implantation achieved a change in low frequency pure tone average ≤ 40 dB HL resulting in a partial preservation of hearing. Our study reports residual hearing preservation using a soft surgical technique with both a shortened and standard length array with full insertion, as well as post-implant speech perception scores over the first year of surgery.
Methods: Thus far three young children ages 5-10 years old with mild to moderate low frequency sensorineural hearing loss sloping to severe to profound sensorineural hearing loss, determined to be good candidates for unilateral cochlear implantation, were implanted using a soft surgical technique for hearing preservation. A shortened electrode array was utilized for two surgeries and a standard electrode array was utilized for the third surgery. Pre and post- operative unaided, ear specific audiograms were completed via age and skill appropriate behavioral audiometric testing to determine hearing preservation. A low frequency PTA for pre and post-implant audiograms were calculated with thresholds at 250, 500, and 1000 Hz. Speech perception scores will be completed beginning at 3 months post implantation over the first year of surgery.
Results: To date, the children implanted with a soft surgical technique with either a standard or shortened electrode array with full insertion, show no greater than a 20 dB shift in low frequency PTA with postoperative pure tone testing. Recipient #1 showed a 20 dB shift, recipient #2 showed an 11.67 dB shift, and recipient #3 showed an 18.3 dB shift. The pre- and post- implant low frequency PTA had a mean change of 16.66 dB HL. Pre- and post-implantation speech perception scores will also be compared over the first year of surgery.
Conclusion: This study has clinical implications that preservation of low frequency hearing is possible in a pediatric cochlear implant population using both shortened and standard length electrode arrays with full insertion.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-1: Team Approach to Maximize Outcomes
Abstract ID: 195
Title: A Survey Developed to Understand the Clinical Practice Involved in Working with Patients with Acoustic and Electric Hearing
Authors:
Camille Dunn, PhD, Sue Karsten, AuD;Otolaryngology--Head and Neck Surgery, Univ. of Iowa, Iowa City, IA.
Abstract:
Introduction: When cochlear implants were introduced in the late 1980's and early 1990's, there was little thought given to hearing preservation. Throughout the more recent years, candidacy for cochlear implantation (CI) has progressed to include those who have residual hearing, whether on the implanted ear or on the ear contralateral to the implanted ear. Along with this evolution in CI candidacy came the advent of not only programming the cochlear implant, but also documenting hearing preservation and programming and verifying the fit of the hearing aid on the implanted ear. As a result, the CI clinical practice has become more cumbersome. The purpose of this talk to better understand, from an audiologist's perspective, the clinical practice involved in working with patients with a cochlear implant who also have low-frequency residual hearing on the implanted ear (acoustic and electric hearing; AEH). The long-term goal is to 1) work toward best practice recommendations to improve clinic efficiency when caring for patients with AEH; and 2) initiate discussion to evaluate and improve reimbursement for professional services as it relates to patients with AEH.
Methods: An online survey was created using Qualtrics Survey Software. The questions in the survey involved 4 main topics related to patients with AEH: 1) Determine professional background of audiologists responding to the survey; 2) Learn how pre-operative and post-operative protocols differ amongst cochlear implant programs; 3) Understand procedures for programming; and 4) Determine clinical visit work flow. The survey was distributed to clinicians via cochlear implant companies and American Cochlear Implant Alliance blogs. Survey responses were tallied and exported to Excel for analysis.
Results: The results of the survey are expected to demonstrate a lot of heterogeneity in clinical procedures for clinics caring for patients with AEH.
Conclusion: As the clinical practice of caring for patients with AEH becomes more complex, clinicians are faced with managing more tasks often within the same amount of appointment time. It is hoped that the results of this survey will provide initial dialogue toward developing best practice recommendations with improved clinical efficiency and reimbursement.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-1: Team Approach to Maximize Outcomes
Abstract ID: 258
Title: Reaching Potentials: Indications for and Perceived Benefit of Cochlear Implantation by Families and Young Children with Unilateral Hearing Loss
Authors:
Aleisha Davis, MPhil, MSLP, Tracy Hopkins, MSLP, Karen Bate, MAud, Alyshia Hansen, BA;The Shepherd Ctr., Sydney, Australia.
Abstract:
Introduction: The benefits of binaural hearing have long been established and bilateral cochlear implantation is now the norm for those who require it yet children with significant hearing loss in one ear, are often told one ear is enough to support communication and spoken language development. Increasingly, cochlear implantation is an option that families of children with Unilateral Hearing Loss (UHL) are keen to explore to obtain the benefits of binaural hearing, despite the small reported evidence of benefit in the literature. This typically stems from the difficulties and challenges they see their children experience in the complex everyday listening and linguistic environments in which they live, and the limited benefit that traditional amplification provides when their hearing loss is in the traditional Cochlear Implant (CI) candidacy range.Adding to the evidence base in this area continues to be problematic as conventional outcome measures (i.e. speech perception and standardised speech and language assessments) are not sensitive enough to capture the communication deficits and difficulties of listening and language acquisition for children with UHL. If cochlear implantation for children with UHL can improve access to sound, facilitate development of auditory skills and reduce listening effort in their everyday listening environments, improved language development can follow. This provides the opportunity of improving the 'average' language skills of a child if their potential is in fact, higher. Understanding the benefits and differences experienced by parents, children and young adults with UHL and CI is important to guide development of these measures in future implant evaluation and post-operative outcomes.
Methods: A retrospective review of 32 families and children with UHL choosing to proceed with cochlear implant evaluation in a not for profit cochlear implant and early intervention program was conducted. Age of implant ranged from 7mths to 16yrs of age. Participants were asked to complete a qualitative measure of perceived benefits of implantation with UHL, developed from clinical experience, client feedback and existing tools and scales. Areas explored included traditional binaural hearing benefits such as localisation, listening and understanding in noise and group settings, as well as impacts of listening effort, motivation, confidence and competence. These were combined with analysis where possible of functional listening measures and speech and language scores over time.
Results: Outcomes indicate strong perceived benefits for parents and young adults beyond measurable differences in speech and language. Primary areas were ease of listening and new found competence and self confidence in listening skills in every day environments.
Conclusion: Given parents and young adults are choosing r cochlear implants with unilateral hearing loss, understanding the outcomes beyond our current measures is a critical area of development to guide informed decision making for families and professionals. Results of this pilot study investigating these perceived benefits provide valuable information for the development of measures to form part of cochlear implant candidacy practices.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-1: Team Approach to Maximize Outcomes
Abstract ID: 72
Title: Optimizing Adult Cochlear Implant Outcomes: When AuD, SLP, and MD Join Forces
Authors:
Aaron C. Moberly, MD 1, Jodi Baxter, AuD 2, Christin Ray, PhD 2, Kara J. Vasil, AuD 1; 1Otolaryngology, The Ohio State Univ., Columbus, OH, 2Speech and Hearing Science, The Ohio State Univ., Columbus, OH.
Abstract:
Introduction: Most practitioners agree that auditory rehabilitation is an integral aspect of the cochlear implant (CI) process. However, structured rehabilitation programs for adult CI users are lacking. Newly implanted patients are often left to use self-guided auditory training methods, such as audiobooks and computer-based programs, despite evidence of minimal compliance with these types of rehabilitation programs. This presentation will address the importance of a collaborative approach between the CI surgeon, audiologist, and speech-language-pathologist for comprehensive auditory rehabilitation to optimize outcomes in adult CI users.
Methods: The collaborative clinical and research approach of an interdisciplinary auditory rehabilitation program for adults with CIs will be discussed, including key components and outcomes of previous participants.
Results: This presentation will result in a review of the existing literature in adult CI auditory rehabilitation, the limitations of current patient self-guided approaches, along with pilot data from 15 patients participating in an ongoing study of auditory rehabilitation outcomes. An emphasis will be placed on the process of forming collaborative relationships among surgeons, audiologists, and speech-language-pathologists to build a comprehensive rehabilitation program, along with tools to implement auditory rehabilitation as part of clinical practice.
Conclusion: While auditory habilitation is an essential part of the post-implantation process for children who receive CIs, structured rehabilitation approaches are widely neglected in the adult population. The goal of this presentation is to motivate audiologists and surgeons to develop a more structured auditory rehabilitation program for their patients and to consider interdisciplinary collaboration with a speech-language-pathologist to optimize outcomes for their adult CI patients.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-1: Team Approach to Maximize Outcomes
Abstract ID: 164
Title: Tailoring Rehabilitation for Adults Following CI - Promoting Social Wellbeing
Authors:
Kylie Chisholm, Speech Pathology, Colleen Psarros, MA, Andrea Gibbons, Teacher of the deaf, Cleon Kirby, Audiology, Cecile Gray, Social Work;SCIC, Gladesville, Australia.
Abstract:
Introduction: A plethora of auditory rehabilitation tools exist for adults receiving cochlear implants, with a strong emphasis on self management. The cochlear implant clinician has an important role in supporting recipients in navigating their way through such materials particularly technology based tools This paper will identify methods of facilitating this navigation as well as identifying the role of direct traditional one to one therapy and the use of volunteers in the rehabilitation process.
Methods: Two to four weeks post device activation clients were referred for screening of their auditory training needs and a review of their goals that had been derived prior to cochlear implantation. Clients were placed in either one or a combination of two conditions: a series of individual sessions; therapy supported through self management with support from a volunteer; Goals were reviewed at a further 4 weeks (8 weeks post device activation) to determine if outcomes had been met. Outcomes were measured through data tracking in user profiles in the on line programs, used as well as subjective data via questionnaires of self rating.
Results: One or more of the client goals were achieved in all conditions within the period of intervention following device activation. Subjective data and self rating scores showed no significant difference regardless of the type of intervention provided. A longer term rehabilitation program was required in most of the cases which was readily accommodated through ongoing self management and volunteer support
Conclusion: A blend of post operative auditory training approaches in the acute phase following device activation was recommended for clients requiring support in their rehabilitation process. Generalisation of skills was facilitated through the use of volunteers and through self management following a period of individual sessions whereby the recipient gained confidence in their skills and abilities. This study provided a template for managing newly implanted cochlear implant recipients across the organisation to ensure that immediate and longitudinal training needs were met. Further we could identify the strategies for developing social wellbeing, building relationships and empowering cochlear implant recipients in their role as communication partners; and develop a working knowledge of strategies to generalise auditory rehabilitation using volunteers

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-2: Quality of Life
Abstract ID: 233
Title: Cross Cultural Comparison of Quality of Life in Children with Cochlear Implants
Authors:
Roshini Kumar, LPCPsychology, Children's Med. Ctr., Dallas, TX.
Abstract:
Introduction: Cochlear implantation in children with significant hearing loss impacts psychosocial well-being in the form of quality of life. To date, no studies compare quality of life of pediatric cochlear implant users cross-culturally. This study reports American parent perspectives of quality of life in children using cochlear implants, and compares these ratings to ratings by British, Dutch, and Finnish parents of children with cochlear implants.
Methods: 33 American parents of children with cochlear implants participated. Mean age at implantation was 2.47 years, mean duration of implant use was 7.47 years, and mean chronologic age was 9.85 years. Data for the British, Dutch, and Finnish samples were obtained through published studies by Archbold et al. (2008), Damen et al (2007), and Huttunen et al. (2009), respectively. All participants completed Children with Cochlear Implants: Parental Perspectives (Archbold et al., 2002) questionnaire, which includes eight psychosocial domains of cochlear implant outcomes: Communication, general functioning, well-being, self-reliance, social relations, education, effects of implantation, and supporting the child. Relationships between quality of life ratings and demographic variables were assessed using Spearman correlations. Cross-cultural differences in psychosocial domain scores were computed using one sample t-tests. An alpha level was set to <.01.
Results: American parents rated communication, general functioning and social relations numerically most positively, and rated education and effects of implantation significantly least positively. Cross-culturally, American ratings were significantly more positive than Dutch parents in all domains. Finnish parents, however, rated all domains significantly more positively than American parents, except for the domains of well-being and supporting the child. American parents rated education and effects of implantation significantly less positively than British parents, but numerically aligned most closely with British parents in all other psychosocial domains.
Conclusion: Limited access to cochlear implant-related accommodations, lack of education regarding the psychological impact of hearing loss and varying parent expectations likely explain the differences in low ratings of education and effects of implantation in the US, and in cross-cultural differences. Providing useful cochlear implant accommodations at school, teaching coping skills for mood changes around hearing loss, and preparing parents for realistic outcomes could greatly benefit children with cochlear implants and their families.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-2: Quality of Life
Abstract ID: 225
Title: Development andValidation of the Protocol for the Evaluation of the Voice of Hearing ImpairedSubjects
Authors:
Ana Cristina Coelho, MsC 1, Alcione Ghedini Brasolotto, PhD 2, Fayez Bahmad Júnior, PhD 1; 1Univ. of Brasília, Brasília, Brazil, 2Univ. São Paulo - Bauru Sch. of Dentistry, Bauru, Brazil.
Abstract:
Introduction: The voice of individuals with cochlear implants has been widely described, and is compromised in terms of type of voice, resonance and suprasegmental features. The validation of a standardized instrument for voice evaluation in this population will contribute with clinical practice and standardization of research in the area, since there is no consensus in the literature about these characteristics and which instrument is more appropriate to evaluate the voice in this population. The purpose of this study was to develop an instrument for evaluating the voice of cochlear implanted individuals, establishing its validity for clinical and scientific purposes.
Methods: The proposed instrument underwent the validation steps suggested by the Scientific Advisory Committee of the Medical Outcomes Trust that include the conceptual and measurement model, determining content validity, reliability, construct validity, interpretability and burden. To validate the instrument, voice samples of 78 cochlear implanted persons aged between 3 and 46 years (experimental group) and their hearing peers (control group) were used. The groups were divided by age range - children from 3 to 5 years; children from 6 to 10 years and adults from 18 to 46 years of age. The participants participated in a voice recording of the sustained vowel /a/, connected speech and conversational speech, which were rated by three voice specialists, using the proposed instrument. The instrument consists of suprasegmental features, breath-voice coordination, resonance, phonation, additional parameter and overall severity of the voice quality. Each parameter is followed by a visual-analog scale.
Results: The evaluation by an expert committee and a pilot test established the content validity of the protocol. Reliability measures showed excellent test-retest reproducibility for the majority of the parameters. Analysis with the ROC curve showed that perceptual evaluation with the sustained vowel does not differentiate cochlear implanted and normal hearing individuals. The same occurred with the parameter “speech rate” for conversational speech, so it was excluded from the protocol. For the connected and conversation speech, the majority of the parameters differentiated the experimental group from the control group with an area under the curve > 0.7. The cutoff values with maximum specificity and sensitivity were 30.5 for mild, 49.0 for moderate and 65.9 for intense deviation.
Conclusion: The PEV-HIS is a reliable and useful tool for assessing the particularities of the voices of hearing impaired individuals with cochlear implants and can be used in research and clinical settings to standardize evaluation and facilitate information exchange among services.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-2: Quality of Life
Abstract ID: 358
Title: Our Experiences With Cochlear Implantation in Single Sided Deafness Patients
Authors:
Magdolna Szönyi, MD, PhD, Nora Kecskemeti, MD, Marianna Küstel, MD, PhD, Anita Gaborjan, MD, PhD, Gabor Repassy, Professor, Laszlo Tamas, Professor;Department of Otorhinolaryngology, Head- and Neck Surgery, Semmelweis Univ., Budapest, Hungary.
Abstract:
Introduction: After acute sensorineural hearing loss with postlingual onset, perception of hearing direction, speech-perception from the affected side and the speech-perception in noise all significantly worsens. These patients usually suffer from tinnitus and imbalance. Single sided deafness is a relatively new possible indication for cochlear implantation. Our aim was to detect the changes in quality of life after cochlear implantation in adults with unilateral acute sensorineural hearing loss.
Methods: We selected 16 patients with acute unilateral profound sensorineural hearing loss in anamnesis who underwent unilateral cochlear implantation between 2015 and 2017. Eight patients had normal hearing (Group 1) and 8 patients had hearing impairment (Group 2) on the other side. We examined using visual analogue scale pre- and postoperatively the followings: the increase of perception of hearing direction, the sound recognition and speech-perception, tinnitus and vertigo and dizziness.
Results: In Group 1 the average time passed between the acute hearing loss and the operation was 12.14±8.4 months. Six patients suffered from tinnitus preoperatively (visual analogue scale score 6.5±2.7) and 3 patients from vertigo (visual analogue scale score 6 ±3.46). In 5 patients the tinnitus and in 2 patients the vertigo have disappeared after the implantation. In Group 2 the average length of time between the acute event and the operation was 11.25±7.9 years. Five patients had tinnitus (visual analogue scale score 7.4±1.5) and 3 patients had vertigo (visual analogue scale score 7.7±1.5). The tinnitus disappeared in 4 patients postoperatively. The vertigo became milder and rarer, but it was detectable in all patients after the operation (visual analogue scale score 3±2.6). We observed significant increase in the perception of hearing direction and a significant improvement in speech-perception in noise in both groups.
Conclusion: In single sided deafness cochlear implantation can result good rehabilitation. The cochlear implantation improves not only the hearing, but as in our study showed, also the quality of life due to the regression of tinnitus and vertigo. After a long period between the acute event of hearing impairment and the operation there is still a significant improvement in the tinnitus. It is a method worth considering for the rehabilitation of single sided deafness patients, even if the condition has existed for a longer duration.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-2: Quality of Life
Abstract ID: 132
Title: Vestibular Function and Quality of Life Assessment Following Sequential Bilateral Cochlear Implantation in Adults
Authors:
Mathieu Trudel, MD 1, Viannique Rolland, M.D. 1, Mathieu Côté, M.D., F.R.C.S.C. 2, Daniel Philippon, M.D., F.R.C.S.C. 2, Richard Bussières, M.D., F.R.C.S.C. 2; 1Otolaryngology-Head and Neck Surgery, Université Laval, Quebec City, Canada, 2Otolaryngology-Head and Neck Surgery, CHU de Québec-Université Laval, Quebec City, Canada.
Abstract:
Introduction: Over the last decade, bilateral cochlear implantation has gained wider acceptance among the surgical community. However, peripheral vestibular dysfunction is a well-known complication of cochlear implantation, and this intervention puts both vestibular apparatus at risk of injury. As of now, there is a paucity of literature evaluating this specific issue, particularly with adult patients. Our study aims to compare preoperative vs. postoperative vestibular function as well as patients' perceived quality of life following sequential bilateral cochlear implantation in the adult population.
Methods: We performed a retrospective cohort study of adult patients with severe to profound sensorineural hearing loss who underwent sequential bilateral cochlear implantation at a single tertiary care center, between May 2014 and May 2017. Vestibular function was evaluated by videonystagmography (bi-thermal caloric irrigation) before the second cochlear implant (CI) surgery, and six months postoperatively. The impact on patients' quality of life was assessed using the Dizziness Handicap Inventory (DHI) questionnaire and results were obtained before the second CI surgery, and six months postoperatively.
Results: A total of forty patients were included in the study. Preoperatively, five patients (12,5%) had unilateral canal paresis and seven patients (17,5%) had total canal paresis. Following the second CI surgery, our preliminary results suggest a slight decrease in vestibuloococular reflex responses (mean: 7%), with only one additional case of total canal paresis. Regarding preoperative quality of life assessment, two patients (5%) had mild handicap, two patients (5%) had moderate handicap and one patient (2,5%) had severe handicap. All other patients denied any dizziness-related quality of life impairment. Preliminary analyses suggest a minimal increase in postoperative DHI scores (mean: 4 points). Only one patient (2,5%) developed a mild handicap, while two patients (5%) reported significant quality of life deterioration.
Conclusion: Based on our preliminary results, sequential bilateral cochlear implantation does not significantly affect both vestibular function and dizziness-related quality of life in the adult population. We observed a discrepancy between the severity of postoperative vestibuloocular reflex anomalies and the patients' reported functional status. Although this intervention appears to be safe, a minority of patients may experience clinically significant impairment of their quality of life. We therefore advocate for meticulous counselling before performing sequential bilateral cochlear implantation.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-2: Quality of Life
Abstract ID: 218
Title: Use of Device in Children with Cochlear Implant in Public Funding System in India-A Preliminary Audit
Authors:
Ranjith Rajeswaran, MASLP, Mohan Kameswaran, MS., FRCS., MAMS., DSc.,;Audiology and Speech Language Pathology, MERF-Inatitute of Speech and Hearing, Chennai, India.
Abstract:
Introduction: Consistent use of the device is one of the important factor influencing the outcome and success of any program at large. Financial stability, motivation of the family, benefit from the device, availability and accessibility of the support system by the clinic are major factors that fuel the sustained use of the device. India is one of the largest growing countries in the world with population of 1.2bil, almost 3% of the children are born with permanent hearing loss every year. Tamil Nadu is one of the southern states in India, since 1997 till 2009 CI were self-funded by the patient. In 2009 the first public funding system was introduced, were the cost of the implant were partially funded by the Government. In 2013, under the Tamil Nadu Chief Minster Comprehensive Health Insurance Scheme CI was completely funded Government for children less than 6 years of age. Madras ENT Research Foundation is the largest CI center in India located in the state of Tamil Nadu. The number of implants per year has exponentially increased since 2013, from 100 to 500 per year. Three years after implementation of the program MERF is interested to audit the program on various aspects, one of the aspects in the audit was to look at the use of device
Methods: 614 children implanted from 2013 to 2015 were included in the study. Phase II and Phase III of the audit will include rest of the children. All the children were categorized based on the use of their device Regular: Uses CI throughout the day except while sleeping and bathing. Irregular: Uses CI irregularly throughout the day. Non-Users: Do not use CI at all. Relevant information related to use of device like, income, education of the parents, age at CI, associated symptoms, mode of communication and educational placement were collected and computed for analyses and statistical significance.
Results: Age at implantation Vs use of device: Out of 614 children 88% were regular user, 9% were irregular user and 3% were non-users. 30% of the regular users were below the age of 3yrs and 70% were above 3yrs at the time of surgery. Among irregular users 21% were below 3yrs and 79% above 3yrs of age at the time of surgery. Among Non-users 13% were less than 3yrs and 87% were above 3yrs at the time of surgery. Annual Income Vs Device Use: All Non-users were within the annual income of less than INR100,000 (USD 1500) ., Education of the Parents Vs Use of device: Though the uneducated parents were present in all the three groups, Non user group has majority of the parents uneducated compared to other groups. Associated Problems Vs Use of device: Children in all the groups had associated problems; however the percentage is very small in regular users compared to irregular users and non-users. Mode of Communication Vs Use of device: Majority of the children in regular and irregular users were verbal, however most of the children in Non-users were gestural Educational placement of the child Vs Use of device: Although majority of the subjects in the 3 categories attend normal school, the percentage of children in non-user category attending normal school is less.
Conclusion: In a large scale public program were most of the families live below poverty line customizing the system is very critical, it is advisable if the policy is revised to extended rehabilitation support from one year to two years or more. Though the results from this study show acceptable percentage of non-users, this can even be reduced by optimizing the policy to suit the society at large.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-3: Patient Care
Abstract ID: 255
Title: Clinical & Recipient Experience with Off the Ear and Over the Ear Processors: A Comparison
Authors:
Allison Biever, AuDRocky Mountain Ear Ctr., Englewood, CO.
Abstract:
Introduction: The cochlear implant industry has experienced dramatic changes with regards to the size and capability of sound processors over the last three decades. The evolution of the sound processor has yielded changes in cosmetics, comfort, battery life and performance. In recent years, many cochlear implant recipients have been offered the opportunity to experience an off the ear (OTE) wearing option, as well as a behind-the-ear (BTE) wearing option. Potential benefits of an OTE processor include discretion, ease of use and placement, as well as comfort. Potential benefits of a BTE processor include familiarity, better retention and a rechargeable battery option. In this retrospective study, the OTE and BTE experience for 129 recipients was examined and the speech perception data comparing OTE and BTE speech perception was analyzed for 28 adult recipients.
Methods: Clinical and recipient experience is presented for 129 adult and pediatric implant recipients who utilized both an OTE and BTE wearing option. The cochlear implant recipients included in this retrospective study design were all implanted between May of 2016 and September 2017. There were 99 adults and 30 pediatric CI532 or CI522 implant recipients. The subjects ranged in age from 96 years of age to 9 months of age. Clinical experience from the fitting and orientation of the OTE and BTE processors was multi-factored. Some of the considerations included ease of having the recipient learn how to place and secure either the OTE or BTE processor, ease of changing batteries, battery life estimations and predictability, as well as performance data for 28 recipients who were tested in noise with their OTE and BTE processors. Recipient feedback comparing OTE and BTE experience was also described. Some of these issues included cosmetics, comfort, ease of use, processor placement, battery life expectancy, and perceived hearing ability.
Results: Subjective data from the recipient experience indicated a preference for the OTE processor in the categories of comfort, ease of use and placement as well as cosmetics. Preference for the BTE processor was noted in the categories of retention and battery life. Clinical considerations for pediatric OTE recipients also included such issues as FM use, battery life, and orientation of the processor and retention. Of the 129 recipients in this retrospective study, slightly over half of the recipients preferred to wear the BTE processor, while just under half preferred the OTE option. A small number of recipients rotated between the two processors depending on their environment. Adult speech perception results indicated equivalent performance with the OTE and BTE sound processors.
Conclusion: Recipient feedback indicated both OTE and BTE processor options have distinct advantages and either one may be chosen as the processor of choice depending on the recipients lifestyle. An analysis of speech perception data collected suggests equivalent results for OTE and BTE processors.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-3: Patient Care
Abstract ID: 34
Title: Equity in Medicaid Professional Reimbursement for Cochlear Implants and Related Services
Authors:
Daniel H. Coelho, MD 1, Joseph Conduff, BA 2; 1Otolaryngology - Head & Neck Surgery, Virginia Commonwealth Univ., Richmond, VA, 2Virginia Commonwealth Univ., Richmond, VA.
Abstract:
Introduction: Financial pressures of cochlear implant programs around the United States are due largely to relatively poor professional reimbursement. We hyopthesize that Medicaid reimbursement rates for cochlear implants and related services fall short of the federal benchmark set by Medicare. In time, these discrepancies could force additional otolaryngologists and cochlear implant centers limit access to care for the most vulnerable in our society.
Methods: Based on Medicare (MCR) claims data, current procedural terminology (CPT) codes used for cochlear implantation and related services were selected. Medicaid (MCD) and Medicare (MCR) payment schemes were queried for the same services in 49 states and Washington, D.C. The difference in MCD and MCR payment in dollars and percent was determined and reimbursement per relative value of work (RVU) calculated. MCD reimbursement differences (by dollar amount and by percentage) were qualified as a shortfall or excess as compared with the MCR benchmark.
Results: Marked differences in MCD and MCR reimbursement exist for all cochlear implant related services, most commonly as a substantial shortfall. The MCD shortfall varied in amount between states and great variability in reimbursement exists within and between audiology, surgery, and speech services. Shortfalls and excesses were not consistent between procedures or states.
Conclusion: The variation in MCD payment models reflects marked differences in the value of the same work provided, which in many cases is far less than federal benchmarks. These results question the fairness of the MCD reimbursement scheme in cochlear implantation with potential serious implications on access to care for this underserved patient population.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-3: Patient Care
Abstract ID: 29
Title: Parent Perspectives on Multidisciplinary Care
Authors:
Ursula Findlen, PhD 1, Prashant Malhotra, MD 2, Oliver Adunka, MD 3; 1Clinical Therapies- Audiology Department, Nationwide Children's Hosp., Columbus, OH, 2Department of Otolaryngology, Nationwide Children's Hosp., Columbus, OH, 3Otolaryngology, Head & Neck Surgery, The Ohio State Univ., Columbus, OH.
Abstract:
Introduction: The multidisciplinary team model has been advocated for pediatric hearing healthcare for several decades. Traditional multidisciplinary teams involve multiple providers meeting with patients and families over the course of one long appointment while more modern models tend to use a combination of multi-provider appointments and multidisciplinary team meetings for care plan formulation. Family-centered healthcare demands that families provide input regarding the care of their children, however very little is known about how families perceive their experience in multidisciplinary team models.
Methods: A parent survey explored the family experience in a traditional multidisciplinary team model for treating children with hearing loss. The team included an otolaryngologist, nurse practitioner, audiologist, speech/language pathologist, and social worker. Questions regarding overall experience, the diagnostic process, treatment plan formulation, communication about additional testing, and information about available resources were surveyed through written and electronic means.
Results: A majority of parents felt positively about the quality of information shared by providers; however many were overwhelmed by the number of providers seen and information shared. These results along with qualitative feedback helped to formulate changes in the care model away from a traditional multidisciplinary team model to a more modern interdisciplinary team approach.
Conclusion: Family experience data reveals that a traditional multidisciplinary approach to hearing healthcare may not provide families with the experience they seek and may add confusion to their child's care plan. A modern interdisciplinary model using a common database to facilitate communication among providers will be reviewed. Advantages and disadvantages of this modern approach will be discussed.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-3: Patient Care
Abstract ID: 128
Title: Challenges of Therapeutic Assessment and Intervention in the Pediatric Single-Sided Deafness Population
Authors:
Tiffany Peng, MD, Megan Kuhlmey, AuD, Stacey Platzman, CCC-SLP, Melissa Oliver, M.E.D., Lawrence R. Lustig, MD, Ana H. Kim, MD;Otolaryngology, Columbia Univ. Med. Ctr., New York, NY.
Abstract:
Introduction: Single-sided deafness in the pediatric population has been shown to yield significant deficits to their socio-emotional, academic, and language development. Cochlear implantation has been demonstrated to confer audiologic and subjective benefits in this population. However, there is little data with regards to how parents and practitioners approach selection of the appropriate intervention for a given child. Furthermore, current understanding remains limited regarding optimal methods for therapeutic evaluation and ongoing assessment of these patients.
Methods: A multidisciplinary think tank was convened involving physicians, speech-language pathologists, and educators to identify specific challenges and formulate strategies to improve the care of pediatric patients with single-sided deafness.
Results: Functional listening evaluations and auditory questionnaires should be implemented specific to this population, to be performed in multiple settings and with involvement from parents. We also discussed specific ways to improve the educational experience of these patients, including strategies for classroom management, routine assessment protocols, and counseling for educators. Similarly, patients and their families must receive adequate counseling in the form of social work, resource sharing, technology management, and review of family dynamics.
Conclusion: Single-sided deafness is an emerging indication for cochlear implantation in the pediatric population. We propose a multidisciplinary and multi-faceted protocol to provide a cohesive care experience in the clinic, audiology testing booth, home, and school.

CI2018 DC Podium and Poster Highlight Abstracts

Session: S5-3: Patient Care
Abstract ID: 266
Title: Standardization of the Punch Technique for Implantation of Bone Anchored Auditory Devices
Authors:
Harold H. Kim, MD 1, Elena Kari, M.D. 2, Benjamin Copeland, M.D. 3, Gary Moore, M.D. 4, Maura Cosetti, M.D. 5, Wayne Shaia, M.D. 6, Jack Wazen, M.D. 7, George Wanna, M.D. 5, Joseph Chang, M.D. 8; 1Otology and Neurotology, NW Ear Inst., Portland, OR, 2Otolaryngology, USC Keck Sch. of Med., Los Angeles, CA, 3Otolaryngology Associates, Indianapolis, IN, 4Central Plains ENT & Audiology, Omaha, NE, 5Otolaryngology, NY Eye and Ear Infirmary, New York, NY, 6Balance & Ear Ctr., Richmond, VA, 7Silverstein Inst., Sarasota, FL, 8Texas ENT Specialists, Houston, TX.
Abstract:
Introduction: Osseointegrative auditory implants provide excellent auditory solutions for patients with single sided deafness and mixed hearing loss where conventional amplification is inappropriate. Minimal surgical site manipulation minimizes postoperative soft tissue complications. The punch hole technique for implantation of osseointegrative auditory devices does not allow adequate visualization of the surgical site leading to some surgeon apprehension. A standardization of the punch technique utilizing modified instrumentation is described where tactile feedback is used.
Methods: Retrospective data was gathered from 9 tertiary referral based neurotology practices in the United States where the standardized punch surgery was planned. Demographic information, records of intraoperative events, any deviation from planned technique, postoperative wound healing, implant survival and surgical time was recorded.
Results: Sixty five patients underwent 68 procedures (38 female, 27 males). In 3 instances, the procedure was converted to utilize the linear incision technique. At first follow up, 91.1% had Holgers 0 or 1 skin outcomes. At second follow up, 95.3% at Holgers 0 or 1 skin outcomes, One patient extruded his implant after the 2nd follow up. Mean surgical time was 12.4 minutes.
Conclusion: The modified punch technique using tactile feedback and modified surgical instrumentation was found to be a safe, simplified technique for implantation of osseointegrative hearing devices. It represents an improvement to traditional techniques utilized previously.