The Importance of Developing Long Range Plans for Students who are Deaf and Hard of Hearing; Case Studies Indicating Significant Growth in Listening, Spoken Language and Academic Skills with Implementation of Specific Intervention Planning

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Topic: Rehabilitation/Educational Aspects

Keywords: Rehabilitation for Children, Children and Recommended Rehabilitation, Integrated/Inclusive Education

Introduction:

Methods: Exciting technological advances continue to evolve surrounding hearing loss and outcomes of children who are deaf and hard of hearing. Early Identification and Intervention programs, cochlear implantation, auditory brainstem implants, hearing aid technology and assistive listening devices have contributed to more children with hearing loss acquiring spoken language and achieving academic success comparable to their counterparts with typical hearing. Despite these improved outcomes a significant number of students continue to lag behind their peers with typical hearing in language and academic skills. With a national spotlight on Common Core Standards and inclusion of children with special needs, students with significant delays in language and vocabulary are often placed in settings where they are unable to fully participate in the classroom experiences. Children whose language skills are more than 2 years behind their peers may appear to be “doing OK” because they are using spoken language and professionals may be impressed by that fact alone. Moreover, children with large gaps in language skills often have splintered skills across various levels where they know higher level vocabulary and complex language structures without mastery the prerequisite skills. This session will include discussion of: specific needs of students with hearing loss in the classroom when a language delay greater than 1½ to 2 years exists; ways consultants in North Carolina have addressed the needs for students with hearing loss within LEAs in a direct, data-driven and pragmatic manner; case studies demonstrating specific situations where long range planning has been implemented, carried out and then significantly improved these children's outcomes and prognosis for academic and vocational success.

Results: Case studies (3) demonstrating significant gains in standard scores and percentile ranks on standardized speech and language testing where a 3 or more year gap once existed and a long range intervention plan was provided and language gaps have been closed and intervention has been reduced significantly rather than increased as the student(s) progressed through school.

Conclusion: Long range plans for teaching children with hearing loss to improve spoken (and in some cases, signed) language skills, when implemented appropriately in an educational setting, can increase a child's access to academic content, increase their options for post-secondary education and subsequently employment and career choices. It is necessary for clinicians who make recommendations for speech-language and audiological services post-cochlear implantation to gain awareness of the needs in the educational setting so the recommendations can address the appropriate needs of their patients who are also students or future students.
Introduction: This paper reports from a study with the aim to develop knowledge about literacy practices in a co-enrollment preschool with deaf (also children with cochlear implants) and hearing children aged 2-5 years. Objective: The research question raised is developed within a sociocultural framework where literacy is seen as social practice and is: What terms of interaction may facilitate access to literacy events for deaf and hearing children.

Methods: The study is an observation study. Data is based on field notes, video recordings and interviews with preschool manager and teachers. The analyses and interpretations are based on transcripts from situated activities and events.

Results: The findings indicate that the preschool staff faces challenges in their efforts to facilitate literacy events that may include the deaf children in interaction and communication with their hearing peers. These challenges seem to be related to communication practices and values, especially in activities where both spoken and signing language were in use. Other challenges were related to structural or institutional constraints and conditions.

Conclusion: Different kind of literacy events offered different kind of literacy learning for deaf and hearing children.
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14-years of Data for Pediatric Cochlear Implant Users Attending an Inclusion Program: An analysis of Vocabulary, Core Language, and Pragmatic Language Use

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Topic: Rehabilitation/Educational Aspects

Keywords: Integrated/Inclusive Education, Speech and Language Development with CI, Rehabilitation for Children

Introduction: Although children with cochlear implants (CIs) have unprecedented access to sound, many face social and academic challenges in the classroom when compared to their hearing peers. In an educational model that uses an SLP as a co-teacher, children with CIs learn alongside a majority of typically developing hearing peers. Specialists in audiology, occupational therapy, and psychology provide support. Over the past 14 years, comprehensive speech and language evaluations have been administered to children in our program every six months. In order to close the gap with hearing peers, each child’s progress is expected to exceed six months gain at each interval. Beginning at 18 months, children benefit from explicit teaching of vocabulary, phonology and other early literacy skills. Specific supports for social, motor and cognitive development are embedded in classroom practice to ensure even development across domains. Longitudinal data will support the use of this model for many young children with CIs.

Methods: The Kaplan-Meier survival function was used to estimate the median time to achieve age-appropriate scores separately for each of the three outcomes (vocabulary, core language, and pragmatic language). Vocabulary standardized assessments included the Peabody Picture Vocabulary Test (PPVT) and the Receptive One-Word Picture Vocabulary Test (ROWPVT). Core language standardized assessments included the Core Language Score from the Comprehensive Assessment of Spoken Language (CASL) as well as the Core Standard Score from the Clinical Evaluation of Language Fundamentals (CELF) and the Clinical Evaluation of Language Fundamentals – Preschool Edition (CELF-P). Pragmatic language was assessed using the Test of Pragmatic Language (TOPL) and the Pragmatic subtest of the CASL.

Results: Of 73 students with vocabulary scores, 58 (79%) students achieved age-appropriate scores during the follow-up period; the median time to achieve age-appropriate vocabulary scores was 19.2 months post-activation (95% CI: 15.9-25.5 months). Of 50 students with core language scores, 41 (82%) students achieved age-appropriate scores during the follow-up period, and the median time to achieve age-appropriate core language scores was 34.1 months post-activation (95% CI: 26.2-43.7 months). Of 48 students with pragmatic language scores, 36 (79%) students achieved age-appropriate pragmatic language scores during the follow-up period, and the median time to achieve age-appropriate pragmatic language scores was 34.1 months post-activation (95% CI: 28.7-44.8 months).

Conclusion: Hearing peers can provide a consistent model of age-appropriate language and social behavior, thus raising the bar for intervention. Outcomes data from our program indicate a 3-year intervention interval for rehabilitation of children with CIs. Children’s outcomes can be optimized in a least restrictive environment that carefully blends individualized levels of challenge and support.
Introduction: As expected, children with hearing loss tend to perform more poorly than age-matched children with typical hearing on phonological awareness tasks (Most, Aram, & Andorn, 2006). Researchers hypothesize that phonological awareness deficits are the result of poor or reduced phonological processing or representations of phonemes in the auditory cortex because of a compressed signal from the hearing device(s) (Ambrose, Fey, & Eisenberg, 2012; Werfel & Schuele, 2011). As a result, delays in discrimination abilities, vocabulary, grammar, and phonological awareness in children with hearing loss persist; especially in those who are late-identified (Ambrose, Fey, & Eisenberg, 2012; Paul, 2009). Despite severe linguistic deficits, children with hearing loss who are late-identified can learn letter-sound identification skills because linguistic knowledge can be acquired independent of phonological awareness (Ambrose, Fey, & Eisenberg, 2012; Lund, Werfel, & Schuele, 2011). However, several letters and corresponding sounds have similar acoustic features, making them difficult to discriminate without explicit instruction (Anthony & Francis, 2005). Thus, an intervention approach that focuses on discriminating the differences between sounds may help to improve a child’s ability to rapidly learn this skill as a precursor to phonological awareness skills that require higher linguistic competency form the learner (i.e., initial sound identification; Rvachew, 2006).

Methods: Two preschool children who were identified after 24 mths of age and received cochlear implants around 40 months of age participated in this study. This study applied a single-subject, multiple-baseline across behaviors design. Probes were administered during baseline and then following intervention daily. The intervention was designed to contrast similar-sounding letter names and letter sounds in accord with each child’s speech perception errors. Hearing history and linguistic profiles were created for each child. Probe measures and Pre/post scores on the Phonological Awareness Literacy Screener (a criterion-referenced measure) were also collected.

Results: The probe measure data demonstrated a functional relation between the dependent variable, the intervention, and labeling letter names and sounds for the two children with cochlear implants. The change in performance from before intervention started to after intervention ended was documented and in the change in PALS scores (desired score range of 58-87) from 12 to 91 (Child 1) and 12 to 70 (Child 2).

Conclusion: Discrimination approaches that focus on the acoustical features of letters and letter sounds may be a method of intervention to consider for some children with hearing loss whose hearing loss was identified late, corrected late and do not respond to traditional methods of instruction.
A Survey of New Jersey School Psychologists' Knowledge of Cochlear Implanted Children

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Keywords: Children and Recommended Rehabilitation, Cognitive and Social Development of Implanted Children, Integrated/Inclusive Education

Introduction: With comprehensive habilitation services post-implementation, children with cochlear implants (CIs) have the opportunity to participate in inclusive educational programs. School psychologists have an essential role in providing services and supports, and managing the educational needs of children with CIs.

Methods: A survey targeting educational psychologists in New Jersey public schools assessed knowledge and expertise in working with children with CIs. The survey evaluated professional knowledge base for those psychology professionals working with children with CI’s including classification, support services, programming, assessment, social emotional functioning, related services, and parent support. School psychologists evaluated their school/district’s resources for providing necessary services and supports to sufficiently assist children with CIs and their families. Possible challenges to provision of services and desired resources to better serve this population in public school settings were also queried. A representative sample of 490 (27.57%) of the states 1,777 NJ public school psychologists responded. Results were provided via electronic survey. Data were analyzed using descriptive statistics and individual item analysis. Open-ended questions were individually reviewed and categorized based upon common themes.

Results: The various categorical findings indicate that New Jersey public school psychologists are integrating and servicing children with CIs moderately well in spite of possessing limited knowledge, skills, and awareness regarding the needs of children with CIs. School psychologists primarily indicate the use of a needs-based and individualized approach when working with children with CIs, and desire to receive more training and information. The study’s practical implications, limitations, and future directions for research are discussed.

Conclusion: Recommendations include disseminating research and findings, training, workshops, manuals, references, and other resources during graduate level training of school psychologists in order to provide background knowledge and intervention frameworks to sufficiently address the needs of cochlear implanted children and their families in the public school setting.
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Improving Student Outcomes: Data-Driven Instruction and Fidelity of Implementation
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Topic: Rehabilitation/Educational Aspects

Keywords: Children and Recommended Rehabilitation, Rehabilitation for Children, Speech and Language Development with CI

Introduction: Modern day hearing technologies do not yet provide a signal that is complete enough for most children with severe and profound HL to learn spoken language (SL) without specific instruction (Ambrose, Fey & Eisenberg, 2012). The majority of these children require teaching that is driven by student performance and individualized objectives (Moog & Stein, 2008). Such data-driven instruction (DDI) ensures that teachers are aware of students’ ongoing progress and even has the potential to accelerate learning to levels comparable to children with typical hearing (Bambrick-Santoyo, 2012; McLead, 2014; Moog & Geers, 2010). Student achievement also relies on teachers’ accuracy in diagnosing student skills and their ability to a) prescribe appropriate teaching activities, b) structure the lesson to ensure success, c) give clear direction for what is expected, and d) provide feedback on the child’s responses (Moog & Stein, 2008). However, using student performance data to inform instructional decisions and monitor implementation of lesson plans reliably is challenging because of issues related to fidelity of instruction and/or treatment integrity (Bianco, 2009). Therefore, agencies who serve this population need to develop and instigate policies/methods that enhance DDI and improve teacher-fidelity of implementation. In doing so, listening and spoken language programs could help children with hearing loss move quickly towards “catching up” to their typical hearing peers. Objective: To determine if DDI can enhance the SL of children with HL.

Methods: 11 children with HL between the ages of 4 and 5 with <85 standard score on speech and language assessments at school enrollment were followed during this study. The DDI model consisted of 4 parts; (1) teacher-made recordings of students’ spontaneous utterances, (2) documentation of student performance on tracking forms, (3) daily data-analysis time for teachers and (4) teacher feedback during instruction. Results from the Teacher Assessment of Spoken Language (TASL) were used at three data points. Standardized assessments were also administered at the end of the school year and compared to a group of 11 students who did not receive data-driven instruction (DDI). A two-way analysis of variance was completed using subject group and TASL scale as the ind. variables and standard score as the dep. variable.

Results: There was a sig. effect of subject group F(1, 3) = 12.921, p < 0.001, TASL scale F (1, 3) = 5.490, p = 0.002, but no interaction F(1, 3) = 0.799, p = 0.499. Post-hoc testing revealed that amongst the TASL sub-scales, the DDI group achieved significantly higher scores than the control group for total language (t = 2.4, p = 0.02) and Expressive vocabulary (t = 2.6, p = 0.01), but not for articulation (p = 0.57) nor for receptive vocabulary (p = 0.09).

Conclusion: Assuring intelligent and regular monitoring of student performance data can enhance LSL outcomes for children with HL.
The Medical and Educational Team – How Clinicians on the UNC Cochlear Implant Team and State Consultants with the NC Department of Public Instruction Work Together in North Carolina to Improve Outcomes for Students with Cochlear Implants in the Regular Education Setting

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Topic: Rehabilitation/Educational Aspects

Keywords: Children and Recommended Rehabilitation , Speech and Language Development with CI , Integrated/Inclusive Education

Introduction: With the increasing number of children with cochlear implants and other hearing technology entering the regular education setting in the public schools, the knowledge, skills and abilities required for the professionals who serve these students is changing rapidly. Many professionals such as teachers of the deaf, speech-language pathologists and audiologists, were trained prior to the technology available today that gives children with hearing loss access to excellent auditory and spoken language abilities. This presentation will report on data collected from the collaborative efforts between the tele-mentoring (REACH program) at The Carolina Children's Communicative Disorders Program (CCCDP) at University of North Carolina at Chapel Hill and the consultants for the deaf and hard of hearing at the North Carolina Department of Public Instruction, Division of Exceptional Children (NCDPI). Professionals in the local education agencies (LEAs) who have received live and distance coaching and mentoring on an ongoing basis via the collaboration between the above institutions/agencies have reported improved confidence in not only their therapy skills, but in their comfort with technology surrounding cochlear implants and auditory brainstem implants, as well as in higher expectations for their students to learn to listen and speak. Self-assessment data as well as ratings from the beginning to end of the program will be presented.

Methods: Using a survey instrument and a document for rating teaching behaviors in Auditory-Verbal Therapy, presenters have questioned participants in the live and distance mentoring programs described above. Survey data will be used to analyze if and to the level that this program is effective. In addition, the clinicians and listening and spoken language specialists (LSLS) at NCDPI and CCCDP will rate the school therapists and other professionals who have participated based on their improvements in the specific teaching behaviors.

Results: Data is in the process of being collected and analyzed.

Conclusion: Expected outcomes include: 1) Significant improvements in confidence level, skills and abilities, and comfort with technology will be evidenced by the teachers' responses who have participated in ongoing mentoring with these collaborative programs. 2) Student specific outcomes will be improved as an indirect result of the school-based professionals receiving intensive and regular coaching. 3) Mentors and coaches' responses will indicate growth in the professionals who have and who are receiving the distance and live coaching. More detailed and longitudinal studies are indicated to show the direct impact that this type of program has on adult learning, however, this preliminary study will show effectiveness in the ability to train and coach professionals who work with children who have cochlear implants and auditory brainstem implants to improve their listening and spoken language skills.
Session 2: Higher Order Processing: Considerations for Children with CI

Phonological Awareness and Alphabet Knowledge Training for Preschool Children with Cochlear Implants

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Topic: Rehabilitation/Educational Aspects

Keywords: Speech and Language Development with CI, Children and Recommended Rehabilitation, Rehabilitation for Children

Introduction: Children with hearing loss show delays in developing spoken language and in acquiring preliteracy skills such as phonological awareness and alphabet knowledge (Moeller et al., 2007). These delays profoundly impede reading development and academic achievement, as well as later employment. Despite recent technological innovations that allow children with hearing loss more access to sound than ever before (i.e., cochlear implants), the median reading level is between third and fourth grade for 18-19 year-olds with hearing loss and hasn’t increased over the past several decades (Qi & Mitchell, 2012). After high school, only about half of individuals with hearing loss are competitively employed (U.S. Department of Education, 2006). According to the American Speech-Language-Hearing Association (ASHA; n.d.), children with hearing loss continue to be an understudied and underserved population. Thus, reports on effective early literacy interventions for children with hearing loss are greatly needed. The objective of this presentation is to detail a successful phonological awareness and alphabet knowledge training program for preschool children with cochlear implants.

Methods: Children participated in phonological awareness and alphabet knowledge training over the course of their 4-year-old school year. Prior to training in the fall, all children completed measures of phonological awareness, alphabet knowledge, and print awareness. Alphabet knowledge training occurred in classroom instruction for 5 minutes per day, 4 days a week. Phonological awareness training occurred in small groups for 10 minutes a day, 4 days a week. Print awareness was not specifically targeted. After completing the training in the spring, the pre-test measures were re-administered. Pre- and post-test scores were compared.

Results: Before training, children’s scores on early literacy measures were generally low: on average, children identified 7.7 letter names (max 52), 1.0 letter sounds (max 26), 1.9 beginning sounds (max 10), 2.7 rhymes (max 10), and 5 print awareness concepts (max 10). After training, children’s scores increased dramatically for phonological awareness and alphabet knowledge: 40.5 letter names, 14.8 letter sounds, 8.0 beginning sounds, 5.9 rhymes ($d = 1.03 - 3.52$); increases in print awareness, which was not specifically targeted in training, were not as substantial (6.8; $d = 0.75$).

Conclusion: Intensive small-group phonological awareness and classroom alphabet knowledge training is effective in increasing skills in preschool children with cochlear implants. Curriculum modifications for children with cochlear implants will be discussed.
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Outcomes of a University Program to Support Literacy Skills of Children Using Cochlear Implants and Professional Competencies of Future Speech-Language Pathologists
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Topic: Rehabilitation/Educational Aspects

Keywords: Speech and Language Development with CI

Introduction: Faculty at a university professional preparation program for speech-language pathologists designed and implemented a summer literacy camp to promote skills of students using cochlear implants. The grant-supported camp, for students ages eight through fourteen has been held for three years. The program provides hands-on experience for graduate students in a federally funded personnel preparation project that focuses on the development of competencies for working with children with cochlear implants.

Methods: Research has historically shown that children who are deaf or hard of hearing have delayed literacy skills. To meet this challenge a literacy camp was designed. To appeal to students, a thematic unit was created each year comprised of texts and literacy activities. In the first year, five students attended and explored fantasy stories and completed cross-curricular enrichment activities. Four graduate students assisted. In the second year, ten students with cochlear implants explored fiction and non-fiction about volcanoes and completed science experiments. Four graduate students participated in camp including reading comprehension exercises and listening activities. This year’s camp will be attended by 16 students, underscoring the growing popularity. Students will explore “Midnight on the Moon,” and complete vocabulary, written language and comprehension exercises and science experiments. Listening and spoken language targets are emphasized throughout the program. Vocabulary and comprehension tests will provide pre- and post-assessment measures. Fluency will be assessed through running records. Students will complete a self-assessment. Parents will complete a survey to evaluate effectiveness/satisfaction. Five graduate students will perform Ling tests, check devices, and assist with instruction and assessment. They will complete pre- and post-assessment surveys to demonstrate development of knowledge and competencies related to providing services to children with cochlear implants.

Results: Pre- and post-assessment scores will measure vocabulary and comprehension growth. Daily running records will assess fluency. Information gleaned from students’ self-assessments will address reading enjoyment and peer relationships. Parent surveys will inform program change to improve outcomes. Graduate students will report on knowledge of relevant teaching strategies and cochlear implant technology.

Conclusion: This program provides needed enrichment for children using cochlear implants in communication and literacy development and provides increased knowledge and skill development for future professionals. Each year of camp has brought change. The number of participants has grown, and responsibilities of graduate students have become more specific. Assessment measures have been refined, and include camp participants, graduate students and parents. Students form friendships. Families are afforded networking opportunities.
The Perception of Prosody and Associated Auditory Cues in Early-Implanted Children: The Role of Auditory Working Memory and Musical Activities

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Introduction: The limited hearing provided by a cochlear implant (CI) can hinder the perception of speech prosody and is associated with poor auditory working memory. Little is known about the role of auditory cues, working memory or other cognitive factors in the perception of word and sentence stress in early-implanted children. Findings from normal-hearing children suggest that musical activities could facilitate perceptual abilities, including prosodic perception, and auditory working memory. From these perspectives, we investigated whether perception of word and sentence stress is connected to auditory acuity for specific acoustic cues to stress, to cognitive skills (auditory working memory or nonverbal IQ) and to musical activities in early-implanted children.

Methods: Perception of word and sentence stress, discrimination of F₀, intensity and duration and forward digit span were measured twice (14 to 17 months apart) in 21 children implanted early (by age 3) and in 21 aged-matched normal-hearing counterparts (aged 4 to 13 years). Children with CIs were grouped according to whether or not they participated in music.

Results: In children with CIs, word and sentence stress perception were more accurate with better forward digit span and intensity discrimination; sentence stress perception was also better with better F₀ discrimination. Children with CIs exposed to music performed better than other children with CIs in word and sentence stress perception and F₀ discrimination. Only children with CIs exposed to music improved with age in word stress perception, intensity discrimination, and improved over time in digit span. Prosodic perception, F₀ discrimination and forward digit span in music-exposed children with CIs were equivalent to the normal-hearing group, while the other children with CIs performed significantly worse than the normal-hearing group. Associations with music exposure were not explained by background factors related to the threshold and comfort levels of electrical hearing, to genetics or to socioeconomic status.

Conclusion: Prosodic perception in early-implanted children is associated with better auditory working memory, discrimination of F₀ and intensity and also with engagement in musical activities. Engagement in music was linked to better performance and/or faster development across all measures linked to prosodic perception. These results suggest that musical activities may be important in the development of F₀ and intensity encoding and may support the development of prosodic perception and broader aspects of spoken language in children with CIs.
Contributions of Phonological Processing to Reading and Spelling in School-Age Children with Cochlear Implants

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Keywords: Speech and Language Development with CI, Rehabilitation for Children

Introduction: Many children with hearing loss, including those with cochlear implants, exhibit poor literacy achievement compared to their same age peers with normal hearing (e.g., Qi & Mitchell, 2012). However, the underlying linguistic mechanisms that contribute to reading and spelling performance for children with hearing loss who develop spoken language have not been well elucidated. Phonological processing is one important predictor of later reading and spelling for children with normal hearing (Adams, 1990; Wagner & Torgesen, 1987), and an increasing body of research confirms that phonological processing also predicts literacy outcomes for children with hearing loss (Geers, 2003; Johnson & Goswami, 2010). Phonological processing broadly refers to three component skills: phonological awareness, phonological memory, and phonological recoding (i.e., rapid naming; Wagner & Torgesen, 1987). Research to date has not evaluated the differing contributions of the component skills of phonological processing to reading and spelling for children with hearing loss. The objective of this study is to evaluate the relative contributions of each of these component skills and to investigate whether the components of phonological processing influence reading and spelling differently for children with cochlear implants.

Methods: Children with cochlear implants in grades 3 through 6 completed a battery of standardized measures, including measures of phonological processing, language, reading, and spelling. All participants used spoken language, had nonverbal intelligence within the average range, and did not have additional diagnoses that affected language, vision, and/or cognition (e.g., autism, blindness, developmental delay). Phonological awareness, phonological memory, and phonological recoding were entered into regression models as predictors of word reading and spelling.

Results: Overall, the results indicate that phonological awareness, phonological memory, and phonological recoding contribute differentially to reading and spelling in children with hearing loss. Phonological awareness made a substantial contribution to both reading and spelling skills. Phonological memory contributed to spelling but not reading skills, whereas phonological recoding contributed to reading but not spelling skills.

Conclusion: Within phonological processing, each of the three component skills contributed differently to reading and spelling skills in children with cochlear implants. These results have important clinical implications for children with cochlear implants, specifically that components within phonological processing should be considered separately when designing reading and spelling intervention programs.
Lexical Organization in Children with Cochlear Implants: Analysis of Latency Measurements for Words Named During Phonological and Semantic Verbal Fluency Tasks

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Topic: Rehabilitation/Educational Aspects

Keywords: Speech and Language Development with CI, Children and Recommended Rehabilitation, Rehabilitation for Children

Introduction: Some children with cochlear implants (CIs) do not achieve age-appropriate language skills. The neuro-linguistic mechanism underlying this outcome is not fully understood. Objective: The aim of the present study was to explore the phonological and semantic organization of the lexicon as a possible source for this observed delay.

Methods: Twenty children with CIs and 20 normal hearing (NH) children, ages 7-10, participated. In this study we analyzed responses on phonological and semantic verbal fluency (VF) naming tasks. In the semantic VF naming tasks, subjects were asked to say, in one minute, as many words as possible, that belong to a certain semantic category (animals and food). In the phonological VF naming tasks, subjects were asked to name, in one minute, as many words as they can, that begin with a specific sound (t, l, f). We analyzed clustering and switching abilities used by the subjects while performing these tasks. The subjects responses were classified into one of two word types: words that were part of a cluster (i.e., were named as part of a sub-category) or words that were produced in isolation (i.e., that were not part of a cluster). Semantic clusters were defined as words with related meanings that belong to the same subcategory (e.g., sea animals seal, dolphin, whale, fish). Phonological clusters were defined as words that share similar phonemes, according to the following criteria: words that begin with two consecutive identical phonemes, words that rhyme, or phonological neighbors (such as fat, feet, foot, fit). Latency time to each named word was measured using the Praat software. Latency measurements were obtained for both words produced in isolation and words that were produced as part of a cluster.

Results: Results show that, in both groups, for both semantic and phonological tasks, latency times for retrieved words that were named in isolation (not part of a cluster) were significantly longer than the latency times for words that were named as part of a cluster. Moreover, latency times to retrieved words were significantly longer in the CI group than in the NH group, in both phonological and semantic VF tasks.

Conclusion: Children with CIs seemed to retrieve words less efficiently during the VF task compared to NH peers. These results might imply that the lexical organization of children with CIs differs from that of NH children; consistent with results recently reported using network analyses. Results will be discussed in terms of their implications for evaluation and habilitation of children with CIs.
Information Recall in Children with Cochlear Implants

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Keywords: Cognitive and Social Development of Implanted Children, Speech and Language Development with CI

Introduction: Short term and working memory (STM/WM) processes are important for language comprehension, mental arithmetic, and reasoning. Based on the auditory scaffolding hypothesis, children who are deaf may show deficits on STM/WM tasks as a result of lack of early access to time and serial order information through listening and spoken language. While children who are deaf and use visual communication have poorer serial order information recall than children with normal hearing (CNH), children with lesser degrees of hearing loss using listening and spoken language are comparable to CNH on serial order coding abilities. The purpose of this study was to examine serial order recall in children with cochlear implants (CIs) who use listening and spoken language and to explore the relationship between serial order coding abilities and measures of verbal and visuo-spatial STM/WM.

Methods: A total of 20 children (6-12 years), were enrolled; 10 CNH and 10 who were deaf and used CIs. A visual measure of serial order coding was adapted from previous studies to examine natural coding preferences. This task was also used to assess the children's ability to recall temporally- and spatially-ordered information when requested. The digit span test and an adapted version of the corsi block-tapping test were used to assess verbal STM/WM and visuo-spatial STM.

Results: The children in this study who were deaf and use CIs exhibited no deficits in the recall of serial order information, mirroring recall patterns shown by CNH and children with lesser degrees of hearing loss. All children performed well on both temporal and spatial recall tasks. Verbal STM/WM was not predictive of the time required for temporal recall for either group of children. However, children with CIs who showed better verbal STM/WM abilities required longer time to recall spatial order than children with CIs who showed poorer verbal STM/WM abilities. This pattern was not present in the CNH. Visuo-spatial STM was positively correlated with processing time on the spatial recall task in CNH, and present but not as strong for children with CIs.

Conclusion: Children with CIs exhibited temporal order serial order coding comparable to the CNH. This equivalency was likely the result of exposure to listening and spoken language afforded to the children who used CIs. Relationships between serial order recall and working memory abilities are less clear. However, they point to potential differences in use of processing strategies between children with CIs and CNH and call for further research examining the interface of the domain-general process of WM with domain-specific storage capacities in children with CIs. For the most part, verbal and visuo-spatial STM/WM abilities were consistent with previous research. Discrepancies between the results of this study and previous findings, and functional relevance of these findings will be discussed.
**Dichotic & Temporal Processing in Pediatric Bilateral Cochlear Implant Users**

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**Topic:** Audiology

**Keywords:** Binaural Hearing, Outcomes, Pre-/Perilingual Adolescents

**Introduction:** Children with bilateral implants often achieve high levels of performance on word recognition tasks. While this demonstrates success, outcomes are variable on more difficult tasks such as listening in background noise. In addition, some children report a preference for one ear and may resist using two devices. This occurs even with excellent word recognition scores in each ear. It is possible that when children prefer one ear or perform poorly in noise, they may have difficulty integrating information from the two implants. This could be the result of binaural interaction (Jerger et al., 1993; Allen et al., 2000; Purdy et al., 2004; Vasil-Dilaj & Brackett, 2013) or a (central) auditory processing disorder (CAPD). Since bilateral cochlear implants are becoming the standard of care for children with bilateral profound sensorineural hearing loss, it is important to determine factors that may influence success or retention of devices. Speech perception tests typically used in clinic do not indicate how the brain integrates and separates information arriving at two ears. These skills can be assessed using measures of auditory processing. At this time, behavioral auditory processing testing has not been conducted with children with cochlear implants. The purpose of this study is to determine if ear preference and/or performance in background noise is related to dichotic and/or temporal processing abilities in children with bilateral cochlear implants.

**Methods:** All participants will be over seven years of age, have symmetrical detection levels, and have at least a 70% word recognition score in each ear. Participants will complete a CAPD test battery including measures of temporal processing (gap detection), speech in noise (BKB-SIN), and dichotic listening (dichotic digits, competing sentences, dichotic rhyme). Stimuli will be equalized for loudness in each ear according to patient report.

**Results:** Preliminary results on the dichotic digits test demonstrate “normal performance” in one ear and poor performance with the second ear. For competing sentences, participants had normal performance in the right ear and poor performance in the left ear. Scores were equal between ears but below normal values on the dichotic rhyme test. Scores from the BKB-SIN suggest participants, on average, have a moderate signal-to-noise ratio loss. Variance in performance will be discussed as related to each test measure and demographic information.

**Conclusion:** Preliminary results demonstrate that pediatric bilateral cochlear implant users can complete behavioral CAPD measures. Asymmetries were present for both the dichotic digits and competing sentences tests. Interestingly the better performing ear was not always the first implanted or the preferred listening ear. The relationship between central auditory measures and speech in noise scores for pediatric cochlear implant users will be reviewed. The implications for rehabilitation will be discussed.
Introduction: The notion that a critical period exists for the preservation of the auditory system in profoundly deaf children has led to an increase in cochlear implantation in children less than one year of age. The safety profile of surgery in this subset of patients remains unclear and warrants further investigation. This study aims to determine if differences in surgical complications exist in children undergoing cochlear implantation between 6 and 12 months of age when compared to children 12 to 18 months of age. Secondary outcome measures including total operative time, anesthetic time, blood loss, and time in the post-operative anesthesia care unit will also be examined.

Methods: Retrospective chart review of patients between 6 and 18 months of age that underwent cochlear implantation at a tertiary care cochlear implant referral center over a 12 year period.

Results: Twenty-three children and 37 ears were identified in the 6 to 12 month age group. Thirty-four children and 47 ears were included in the 12 to 18 month age group. As expected, children undergoing cochlear implantation between 6 and 12 months of age weighed less (8.75 +/- 1.18) than children having surgery between 12 and 18 months (10.0 +/- 1.7, p=0.002). A surgical complication was defined as follows: facial nerve injury, wound infection, pressure ulcer formation, incisional breakdown, fluid collection, hematoma, or skin flap necrosis. The rate of surgical complications in the 6 to 12 month group was 8.1% (3/37 implants) and did not differ from that observed in the 12 to 18 month group (6.3%, 3/47 implants, p=1.00). Further, no difference in rate of re-admission or re-operation for reasons related to a surgical complication after implantation was noted between age groups (p=1.00 and 1.00, respectively). To examine perioperative metrics, simultaneous bilateral implant cases were excluded resulting in 59 unilateral implants for analysis. No difference was observed in total operative time (p=0.74), anesthetic time (p=0.27), blood loss (p=0.16), and time spent in the post-operative anesthesia care unit (p=0.98) when comparing the 6 to 12 month group to the 12 to 18 month group.

Conclusion: The safety profile of cochlear implantation in children between 6 and 12 months of age does not appear to differ from that observed in children 12 to 18 months old.
Outcomes for Infants Receiving Cochlear Implants Under 12 Months - How Early is Too Early?

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Topic: Audiology

Keywords: Young and Very Young Children, Outcomes

Introduction: Cochlear implantation for children with severe-profound hearing loss under 12 months of age is becoming more widespread. Professionals and parents alike are now keen to access both short and long term evidence to support this. To date this evidence has focused on the medical and surgical aspects, as well as results of formal speech, language and listening assessments. Additional factors should also be considered including the measurement of listening in more complex environments as children get older, and the impact of early implantation on attachment and relationships as perceived by the family. This provides a holistic view of the overall outcomes for the individual and their family.

Objective: To review the medical, clinical and personal outcomes of 40 children who received their first cochlear implant under 12 months of age.

Methods: Formal and informal assessment tools were used to assess the listening and language abilities of 40 children who received at least one cochlear implant prior to 12 months of age. Children were assessed at 6, 12 and 24 months post activation, and chronological ages 3, 4 and 5 years. Qualitative analyses of family feedback on the impact of attachment and relationships were examined. Medical records were reviewed for information about surgical outcomes and any post-surgical management.

Results: By 3 years of age the cochlear implant users who received the earliest implantation outperformed those who received implants after 12 months and was comparable to their hearing peers. Those who were implanted at the earliest ages consistently showed better performance over time than those implanted between 7-12 months. There was a wider spread of results at 3 years chronological age, with the highest performers again being those children who received implants earliest. Although evidence suggests children implanted closer to 6 months initially do better in their spoken language development, qualitative feedback from families indicates benefits beyond language scores that need to be considered when evaluating the long-term impact of implanting at a very early age. From a medical perspective there was no significant difference in the incidence of medical issues after implantation under 12 months versus over 12 months of age.

Conclusion: Outcomes for children implanted very early indicate that age appropriate outcomes can be reached by 3 years of age. Various factors influence age of implant and also influence longer-term outcomes. Additional complexity in any aspect of the child and family’s situation including medical, audiological and family factors will likely add time to the cochlear implant evaluation period; however this is appropriate and necessary for the best possible outcomes for each individual child. For many infants we should consider the potential benefit of early implantation as well as the impact of waiting for a particular age on the child, the family and the overall long term outcomes.
ACI2014
Lexical Comprehension Development in Long-Term Early-Implanted Children
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Topic: Rehabilitation/Educational Aspects

Keywords: Speech and Language Development with CI, Rehabilitation for Children, Children and Recommended Rehabilitation

Introduction: Early cochlear implant (CI) seems associated with better speech development than later CI. Objective: the aim of this study was to investigate the effect of age at CI activation on the lexical comprehension development of implanted children.

Methods: retrospective chart analysis. Thirty children (21 females; 9 males) with congenital bilateral severe to profound sensorineural hearing loss (SNHL) were included in this study. All children were implanted with a Nucleus multichannel device (Cochlear LTD, Sydney, Australia). The mean age at cochlear implant activation was of 14.7 months (SD +/- 5.3). All children had normal nonverbal intelligence scores (mean: 20.2; SD +/-3.1) as measured by Raven’s coloured progressive matrices. The Peabody Picture Vocabulary Test – Italian version (PPVT) was used to assess the receptive vocabulary skills. We submitted the test at chronological age of 48 months and 60 months. The score of PPVT was matched for correlation with age at CI activation.

Results: Receptive vocabulary scores were highly related with chronological age at CI activation. 48 months old CI children had higher PPVT score when they were implanted earlier (p<0.001). The same trend was found with 60 months old children (0.01>p>0.001).

Conclusion: The CI age seems a predictive and determinant factor for later language competence. Children with early implantation received effective benefits for developing lexical comprehension skills.
Introduction: Listening and Spoken Language specialists team up with parents to elicit active listening in their children. During sessions caregivers practice using strategies such as expectant look or narrating actions as they interact with their child. Little by little listening becomes part of their personality and their everyday life. In the aural habilitation process the speed at which each caregiver becomes aware of listening strategies greatly varies. Objective: We ask ourselves the question: can the use of mindfulness strategies during LSL sessions increase "in the moment" interactions between caregivers, their children and the clinician?

Methods: We retrospectively looked at a set of LSL strategies acquired by 14 caregivers at 18 months post initiating Auditory Verbal Therapy. Without correlation to patient outcomes caregivers were placed in different categories based on their use of LSL strategies. The following criteria was used: Limited – Not observed during therapy Emerging – observed during therapy, with some prompting Progressing – Observed during therapy, without prompting Spontaneous – Observed during therapy, in the waiting room

Results: At 18 months post initiating Auditory Verbal Therapy a high percentage of caregivers were still emerging in their use of the "Self talk" strategy and of the "Consistent bilingualism" strategy.

Conclusion: Although there are many different factors that affect parent/child interactions (such as parent learning style, therapy style, cultural difference, and social economic status) we ask ourselves the question: can the use of mindfulness strategies during LSL sessions increase "in the moment" interactions between caregivers, their children and the clinician? This presentation will provide a literature review of how mindfulness training has been used in the past. Two case studies involving the use of mindfulness strategies to foster "in the moment" interactions during listening and spoken language sessions will be shared.
ACI2014
Parent-Child Interaction in Deaf Toddlers with a Cochlear Implant
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Topic: Rehabilitation/Educational Aspects

Keywords: Speech and Language Development with CI, Cognitive and Social Development of Implanted Children

Introduction: Parents are an important influence on young children's development. A positive parent-child interaction is related to positive child developmental outcomes. Interactions between hearing mothers and their young children with hearing loss showed to be less positive. Their interactions are found to be shorter, more dominated by the parent and more miscommunication is present. An important aspect of parent-child interaction, that showed to be predictive of child language outcomes in children with a CI, is maternal sensitivity (Quittner et al., 2013). Objective: The main goal of the present study was to examine whether parent-child interaction in deaf toddlers with a CI differed from that of normal hearing children (NH). Further, the relation between parent-child interaction and child language ability was investigated. More insight in the parent-child interaction of young CI users is important for early intervention services.

Methods: The parent-child interactions of 20 CI children (30-42 months of age) were compared to 20 normal hearing peers. All participating deaf children were detected by neonatal hearing screening and participated in an early intervention program. Parent-child interaction was videotaped and coded during play. The emotional availability scales (EAS) (Biringen, 2008) were used as measure of parental child interaction. The EAS consists of six dimensions. Four scales assess maternal behavior: Sensitivity, Structuring, Intrusiveness, and Nonhostility. Two scales capture child behavior: Responsiveness and Involvement. Further, the duration of interaction and amount of parental initiatives were investigated. For language ability the (revised) Dutch version of the Schlichting Test was used.

Results: Preliminary results of 20 CI and 20 NH will be presented.

Conclusion: Preliminary results of 20 CI and 20 NH will be presented.
Introduction: Early cochlear implant (CI) seems associated with better social conversational skills development than later CI. Objective: the aims of this study were: 1) to investigate the effect of age at CI activation on the social conversational skills development of implanted children under 2 years old; 2) to examine the role of age at deafness diagnosis and maternal educational level on social conversational skills.

Methods: retrospective chart analysis. Thirty deaf children who received CI before they were 24 months old (average: 15.5 months; SD +/- 5.7) were included in the study. The Italian version of social conversational skills rating scale was used to assess the social conversational skills. Children had a CI use more than 6 months. The questionnaire was submitted after 6 and 12 months of CI activation. The scores were matched for correlation with age at CI activation, age at deafness diagnosis and maternal education level.

Results: Social conversational skills scores were related with chronological age at CI activation after 6 and 12 months of CI use. The maternal education level had a positive significant effect on development of social conversational skills.

Conclusion: The age at CI activation seems a predictive and determinant factor for later social conversational skills.
Structured Assessment of Nonverbal Communication Skills in Children with Hearing Loss

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Topic: Rehabilitation/Educational Aspects

Keywords: Cognitive and Social Development of Implanted Children , Speech and Language Development with CI

Introduction: Cochlear implants (CIs) promote oral language development in children with hearing loss. Despite advances in CI technology and clinical practice, however, there continues to be children who have language delays following implantation. Thus, there is a need to identify children who are at risk for language delays as early as possible. Nonverbal communication, such as eye gaze, gestures and vocalizations emerge within the first year of life in typically-developing infants. Many of these behaviors positively correlate with vocabulary size at 2 years of age. In other words, the emergence of nonverbal communication in infancy predicts spoken language outcomes in toddlerhood. Infants with hearing loss also develop nonverbal communication. Existing literature suggests, however, that the type and quantity of nonverbal behaviors differ between infants with hearing loss and typically-developing infants. Very little is known about whether this difference in nonverbal communication contributes to the observed individual variability in language outcomes of children with CIs. The prospective, longitudinal study described in this presentation is designed to evaluate this relationship.

Methods: Children with bilateral sensorineural hearing loss who are between 9-24 months of age were recruited to participate in a structured assessment of nonverbal communication. The Early Social-Communication Scales (ESCS, Mundy et al., 2003) is a structured measure of nonverbal communication that provides scores on three categories of nonverbal communication: joint attention, behavioral request, and social interaction. Children were evaluated during the interval between CI surgery and activation. At one year following activation, children will be administered standardize language assessments.

Results: To date, six infants with hearing loss have been evaluated with the ESCS. As predicted, all children exhibit nonverbal communication behaviors. Preliminary analyses reveal, however, differences in the amount and quality of joint attention behaviors in the cohort of children with hearing loss relative to normative data. Infants with hearing loss initiate joint attention events as well as behavioral requests similarly to age-matched hearing infants, but tend to use eye contact rather than a combination of eye contact and pointing. Responses to joint attention bids and behavioral requests are fewer than those observed in age-matched hearing infants.

Conclusion: The ESCS is a structured assessment of nonverbal communication that can be used with children who have hearing loss. Preliminary data from the current prospective study suggests that there is variability in nonverbal communication among children with hearing loss. This study is part of an ongoing longitudinal study that will examine the links between nonverbal communication abilities and standardized measures of receptive and expressive spoken language in children receiving cochlear implants.
Session 4: Complex Cases: Pediatric CI

ACI2014
The Sound Access Parent Outcome Instrument for Children with Complex Needs
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Topic: Rehabilitation/Educational Aspects

Keywords: Multiple Handicapped Children, Patterns of Early Social-emotional Development in Young Children with Cochlear Implants, Quality of Life

Introduction: The literature related to cochlear implantation in children with multiple disabilities (CMD) is uniform in identifying the need for outcome instruments that capture the kinds of changes that these children demonstrate. This paper describes a pilot of the Sound Access Parent Outcome Instrument, (SAPOI) aimed at capturing outcomes identified by parents as priorities in a valid and reliable way and that are not captured in other instruments in use. The SAPOI was based on the results of the first study phase (Hayward, Ritter et. al., 2013). It can be used with children and families using any kind of appropriate amplification, but its primary purpose is to capture outcomes of cochlear implantation identified by parents of CMD as important. The SAPOI is intended to be used as part of the cochlear implant assessment battery. The SAPOI can be administered either as an interview or independently completed by parents.

Methods: Criteria for inclusion were parents of children who had used amplification all or most waking hours for at least one year, for whom their child’s severe-to-profound hearing loss was not the primary developmental influence and for whom English was the first language. All parents who fit the criteria and were followed through the first author’s Audiology department were invited to participate. A pilot of the SAPOI was completed to examine item performance, receive further feedback from participants and to establish test-retest reliability. Further refinement took place through structured questionnaires completed by Subject Matter Experts (SME).

Results: Results are based on 12 First administrations and seven pre and post tests, administered approximately one month apart and on feedback from participants and SMEs. Pre and post test Wilcoxon results of the 37 SAPOI items with p-value greater than 0.05 suggests strong test-retest reliability for this kind of measure. Sample quotes from expert judges: “It’s terrific – nothing like this exists”; “the comprehensiveness is very good; dimensions are those that, in our experience, are important to parents”; “combining this tool with the IT-MAIS or Little Ears would take information to the next level”; “it gives parents a legitimate voice”; “could be used pre-implantation to assist parents in considering what they would consider benefit for their child”.

Conclusion: The SAPOI shows promise as a valid and reliable addition to the assessment battery currently used for children with multiple handicaps who use cochlear implants. It is sensitive to the results of access to sound in this population that currently used speech perception and standardized speech and language assessments do not address or that can not be used due to developmental constraints.
Mental Health Problems in Adolescents with Cochlear Implants (CI)

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Topic: Rehabilitation/Educational Aspects

Keywords: Cognitive and Social Development of Implanted Children, Social Situation of implanted children, Quality of Life

Introduction: The authors aim was to compare the mental health of adolescents with cochlear implants (CI) to normal hearing peers. The authors determined the hypothesis that the vulnerability for mental health problems of young CI users is comparable (not increased) to that of normal hearing adolescents except peer problems. The restriction was introduced, that this thesis is only valid for CI-users who are not at risk for intellectual disabilities and learning disorders, nor for persons with visual impairments or with inner ear malformations. A further aim was to provide information about the relation of hearing variables (e.g. aided thresholds) to mental health of CI users.

Methods: The multicenter study included 280 adolescents, 140 adolescents with CI (mean age= 14.7, SD= 1.5 years), 140 normal hearing adolescents (mean age= 14.8, SD= 1.4 years) matched for age, gender and social background, and parents and teachers of both groups. The inclusion criteria, following below, were fulfilled by all CI users: a) age ranging between 12 and 17 years, b) maximum age of 24 months at onset of hearing loss and c) CI use (first CI) for at least three years. Out of the 140 CI users 35 participants with an increased risk for mental health problems were found. The “risk cases” met at least one of the following criteria: i) risk for general learning disorders or intellectual disabilities, ii) visual impairment or iii) inner ear malformations. All 140 normal hearing peers were without any intellectual disabilities or visual impairment. Mental health problems were assessed with the “Strengths and Difficulties Questionnaire” (SDQ), a brief screening measure for behavioral and emotional disorders in children and adolescents. The versions “SDQ self” as well as “SDQ parent” and “SDQ teacher” was used. Medical and audiological data were obtained from clinic files. Other demographic data were collected by parent surveys.

Results: For the “prosocial behavior score”, the difficulty subscales “conduct problems”, “hyperactivity”, and the “total difficulty score” no significant differences were found between adolescents with CI and normal hearing peers (self-, parent-, teacher rating each). However, there were significantly more peer problems. Additionally, in the teacher rating there were significantly more emotional symptoms. The increased incidence of emotional problems vanished, when all “risk cases” were excluded. CI users who were able to hear and to understand speech in noise received a lower total difficulty score (less problems). The lower the (minimal) benefit of hearing aids prior to implants, the more were the peer problems.

Conclusion: Mental health problems of adolescents with CI concern particularly the interaction with peers. Apart from that, and by excluding “risk cases”, the mental health of CI users is comparable to that of normal hearing peers. Residual hearing in the first years of life may protect against peer problems.
New Challenges for Care Favoring Young Implanted 0-4 Years Old Children with Multiple Disabilities

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Introduction: New legislation reinforces the inclusion of children with multiple disabilities, favoring access to day-care centers. With the increase of young hearing-impaired children receiving cochlear implants, a concomitant increase in the presence of children with multiple disabilities is observed. This has led to the development of interdisciplinary synergies that are able to provide the appropriate care. The newly defined care pathways allow better early intervention services, specifically designed to meet the children’s special needs, within adapted institutional settings.

Methods: An audit based on qualitative interviews was conducted by an external consultant with the professional teams concerned (special educators, speech therapists and other specialists). After both, the individual and collective interviews, “mind maps” or diagrams, representing organizational needs, where used to further the conversations and define institutional change processes and care pathways.

Results: The outcome of the audit shows that highly functional networks and best practices were identified in relation to caring for implanted children who are only hearing-impaired. This lead to increase the number of children entrusted to our center and to a high level of parent satisfaction. Nevertheless, the findings lead to questioning the quality of care for recently implanted infants with multiple disabilities (accompanying families in crisis, facing multiple disabilities, affecting prognosis and life expectancy). The outcomes not only reinforced professional good practices, but also produced useful recommendations for coping with the new challenges confronting the teams. An essential outcome was the implementation of protocols concerning safety issues. The change work that emerged from the dialogues, created new synergies between the different teams, defining roles and processes of communication, increasing efficiency. This enlarged sphere of cooperation brought forth a new interdisciplinary dynamic improving care.

Conclusion: The results recommended: (1) consolidation and widening of partnerships and circles of cooperation (particularly with various medical disciplines like pediatric neurology or ophthalmology), (2) reinforcement of the coaching of the regular preschool education staff, where hearing-impaired children receive daycare, (3) enhancement of continuing education with new partners and of the knowledge development within teams, reinforcing the “learning organization”, (4) development of leadership and management skills within teams, ensuring good governance, complementary and multidisciplinary best practices, as well as a shared institutional vision. Finally, care is revisited as a holistic concept, enhancing inclusive values even for children with multiple disabilities, providing them with the best possible early intervention services, an important social capital for families seeking to support and accompany their hearing-impaired children.
ACI2014
Outcomes of Cochlear Implantation for Pediatric Patients with CHARGE Syndrome: Beyond Surgery

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Topic: Audiology

Keywords: Outcomes, Fitting

Introduction: CHARGE syndrome is characterized by: coloboma, heart defect, atretic choanae, retarded growth or development, genital hypoplasia, and ear anomalies. Owing to the abnormal ear anatomy and neurological complexity found in persons with CHARGE syndrome, they are not typical candidates for cochlear implantation.

Objective: This study examines the outcome of standard cochlear implantation for patients with CHARGE syndrome who received a unilateral cochlear implant.

Methods: Methods of study included: (1) Retrospective analysis of medical records of 734 children who have received cochlear implants at a tertiary care pediatric hospital and identification of all patients with cochlear implants who had a diagnosis of CHARGE syndrome (N=3); (2) Review of outcome data (including patient demographics, surgical outcomes, audiograms, post-implantation sound field and word testing and most common mode of communication); and (3) Review of parental report, as documented in the medical record, regarding perceived benefit of the cochlear implant.

Results: Patients have shown variable benefit from their cochlear implants. All use American Sign Language for their primary mode of communication, and wear their processors consistently. Parents report greater connectedness following implantation.

Conclusion: Variable benefit from the cochlear implants is noted. Outcomes for this small group are not on par with expectations of other children; thus, cochlear implants teams are encouraged to think more broadly regarding cochlear implant candidacy. In addition to surgical concerns, considerations should include: expected auditory outcomes, likelihood of consistency of use of the processors, expected changes in quality of life outcomes and potential implications for communication modality/preferences.
ACI2014
Cochlear Implantation in Children with Autism
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Topic: Rehabilitation/Educational Aspects

Keywords: Multiple Handicapped Children , Quality of Life , Speech and Language Development with CI

Introduction: The age of cochlear implantation is decreasing and many of the implanted kids are diagnosed with autism after the surgery. Kids with dual diagnosis of autism and hearing loss have specific challenges in regard of programming and language development.

Objective: The objective of this study is to assess the outcome of cochlear implantation in this population and discussed how to overcome the challenges.

Methods: This is a retrospective review of implanted children diagnosed with autism in our center. A quality of life questionnaire is also completed by parents and analyzed

Results: Post-operatively, more than 67% of children improved their speech perception skills and 60% improved significantly their speech expression skills. The top three reported improvements after cochlear implantation were name recognition, response to verbal requests, and enjoyment of music.

Conclusion: Cochlear implants are effective and beneficial for kids with autism even though development of language may lag behind that of neurotypical hearing impaired kids. Individualized programming is recommended to increase success post implantation.
Introduction: Many children with auditory neuropathy/dysynchrony have multiple risk factors for hearing loss. In addition, children with neuropathy have a wide range of hearing loss, speech perception scores, and listening abilities. The aim of this study was to investigate risk factors, the percentage of patients with neuromaturation, and speech perception scores with hearing aids and/or cochlear implants for our patients with auditory neuropathy/dysynchrony. We will also explore the benefits of interdisciplinary rehabilitation and specific challenges we encounter when working with this patient population.

Methods: The purpose of this study is to analyze and display risk factors, rates of neuromaturation, and pre- and post-speech perception and functional assessment scores for children using cochlear implants or hearing aids. We will also highlight specific challenges within this population, as well as the importance of an interdisciplinary team, including the caregivers, speech pathology, audiology, otolaryngology, social work, deaf education, and developmental psychology.

Results: The medical, audiologic profiles and speech perception scores for approximately 95 pediatric patients with neuropathy will be presented from data gathered in a retrospective chart review.

Conclusion: The medical and audiologic profiles for our patients with AN/AD are diverse. Few patients experience neuromaturation. Many patients with AN/AD are not successful with hearing aids. However, many patients with AN/AD are successful with cochlear implants. Interdisciplinary rehabilitation is critical for appropriate management of our children with auditory neuropathy/dys-synchrony.
Communication Outcomes for Children with Cochlear Implants and Autism Spectrum Disorder

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Topic: Rehabilitation/Educational Aspects

Keywords: Rehabilitation for Children, Multiple Handicapped Children, Speech and Language Development with CI

Introduction: Autism Spectrum Disorder (ASD) and significant hearing loss negatively impact a child’s communication. Research indicates that a co-occurring diagnosis of ASD and hearing loss is increasing. Universal newborn hearing screening has lead to earlier diagnosis of hearing loss resulting in an increased number of children receiving cochlear implants before 18 months of age. Reliable diagnosis of ASD typically occurs during the preschool years for hearing children but later for children with hearing loss. Given these facts, a diagnosis of hearing loss and possible cochlear implantation will likely occur prior to a diagnosis of ASD. This poses particular challenges for clinicians working with children who have this dual diagnosis due to their complex communication needs. Objective: The purpose of this retrospective study was to identify communication paths and analyze communication outcomes of children in our program with a dual diagnosis of ASD and hearing loss.

Methods: A retrospective chart review of children with cochlear implants and an ASD diagnosis within our center was conducted. Each child’s chart was reviewed for: 1) age of diagnosis of hearing loss; 2) age of cochlear implantation(s); 3) age of diagnosis of ASD; 4) early intervention/educational history; 5) communication approaches explored; and 6) child’s current communication modality(s).

Results: Chart reviews indicate that 100% of the children utilized their cochlear implant(s) consistently. Data also indicate that 90% of the children currently utilize a combination of communication modalities (i.e. spoken language, sign language, Picture Exchange Communication System, alternative augmentative communication, gestures). Finally, 70% of the children initially used a single communication approach, but over time a variety of communication modalities were introduced to increase functional communication.

Conclusion: The dual diagnosis of hearing loss and ASD impacts the communication development of children. This case review indicated that children with a dual diagnosis will most likely use a variety of modalities to communicate. As this population of children increases it is imperative that clinicians: recognize the early indicators of ASD in children with hearing loss; be knowledgeable about a wide range of appropriate modalities to try with these children; be flexible with teaching strategies when developing treatment plans; and counsel the child’s family regarding the benefits of using a variety of communication approaches.