

BOOK REVIEWS

P. L. Marston

Physics Department, Washington State University, Pullman, Washington 99164

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Cochlear Implants: Objective Measures

Helen E. Cullington (Editor)

Whurr Publishers/Taylor & Francis, London, 2003

241 pp. Price: \$46.95 (softcover), ISBN: 1861563248.

This book contains an excellent collection of papers on objective measures for assessing and managing patients with cochlear implants. In recent years, cochlear implants have become increasingly more successful and have gained wide use around the world. Some of the challenges still facing the clinician include confirmation of candidacy, verification of the integrity of the device, and determining ideal programming parameters for individual patients. While some patients are able to provide subjective feedback, many, including children and those with disabilities, cannot. Determining appropriate stimulation levels for each patient can be challenging and time-consuming. A number of objective measures have therefore been developed or adapted that are aimed at facilitating and standardizing clinical practice. This book is intended as a guide to clinicians on objective measures that can be used to determine preimplantation candidacy as well as postimplantation device performance. Clinical availability of such tools is extremely important for achieving high success rates in implant patients. An introductory chapter by the editor provides a good anchor and framework for the chapters that follow, with a helpful table for summarizing the main functions provided by each objective measure.

The seven chapters that follow are written by expert clinicians and researchers. Each author pays close attention to the integrity of the measurements and their feasibility in a clinical setting. They include definitions of terms, evidence from clinical and basic research, and suggestions for clinical fitting strategies. A number of the authors specifically discuss which of the currently available implants can be evaluated using their measures. A particularly effective structure is the inclusion of a literature review, description of methods, required equipment, and procedures for administration of the measures. This book is not intended as a detailed research-oriented resource. The chapters generally refer to the research that ultimately provides guidelines for parameters that are most useful clinically. However, it is often made clear that a larger body of research exists on most topics, beyond the scope of the book. The book is therefore particularly helpful as a guide for one who is skilled in the art of cochlear implant mapping and evaluation using behavioral techniques. In addition, it can serve as a useful resource for researchers who may not be intimately familiar with objective methods. Having all the current objective methods presented in a cohesive package is extremely valuable. The manageable length of each chapter, and the care that the authors generally take in providing outlines and summaries, is effective for comparison of the various methods, their pros and cons.

To date, there are three cochlear implant devices with FDA approval in the USA: Clarion, Med-El, and Nucleus. Laura and MXM are two other devices discussed in a number of chapters as well. Not all devices can be evaluated with each objective method, and the applicability of each method to the various devices is apparent in each of the chapters. For example, different methods of telemetry allow for measurement of the link between the radio frequency output and link to the implant, electrode-tissue interface, and evoked activity. These measures depend on device-specific components supplied by the manufacturer; while the first two features are available for the three common devices, the latter one is not. The electrically evoked stapedial reflex measure does not depend on device-specific interfaces, and

can be applied to any of the devices. Similarly, electrically evoked brainstem, middle latency, and cortical responses can serve as a powerful tool for showing evidence of cochlear-implant driven responses at various levels within the auditory system. Measures at the levels of the brainstem offer information regarding the presence of intact auditory neurons and candidacy, as well as postoperative assessment and management, and have been widely used in young children. Measures at the level of the cortex are important for understanding how the use of an implant affects higher brain functions such as language. By learning about which objective method may be readily available or implementable, clinicians can refer to this book as a guide for determining which device may be most appropriate for each patient.

RUTH LITOVSKY

Waisman Center

1500 Highland Avenue

University of Wisconsin—Madison

Madison, Wisconsin 53705-1103

Cochlear Implants for Young Children (2nd edition)

Barry McCormick and Sue Archbold, Editors

Whurr Publishers Ltd., London and Philadelphia, 2003.

425 pp. Price: \$69.95 (softcover), ISBN: 1861562187.

Cochlear implantation of profoundly deaf children has become commonplace as the benefits of the implant have become more understood. Deaf children less than a year old increasingly receive cochlear implants, and in many cases are being mainstreamed successfully within a few years postimplantation. As the number of children receiving cochlear implants continues to increase, there is an increased urgency in establishing guidelines for the clinical management of cochlear-implanted children. Cochlear implants, in general, present challenges for all involved (the recipients and their families, the doctors, audiologists, research and medical professionals, educators, etc.); cochlear implants in children present unique challenges. Methods of pre- and postimplantation assessment, evaluation, and progress monitoring must all be modified considerably from the adult model to be usable for the infant or the growing child. In the second edition to their book, *Cochlear Implants for Young Children*, editors Barry McCormick and Sue Archbold, both of the Nottingham Paediatric Cochlear Implant Programme, provide a framework to address these challenges. Pre- and postimplant evaluation methods, surgical techniques, electrophysiological measures, and rehabilitation techniques are discussed in the book's 11 chapters, as well the emotional effects of hearing loss and implantation on children and their families. This volume is likely to become a definitive guide for clinicians working with cochlear-implanted children.

The Nottingham Paediatric Cochlear Implant Programme is the largest cochlear implant center for children in the U.K. Since its inception in 1989, the Nottingham center has implanted more than 400 children, mostly between 3 and 5 years old. In the first edition of this book (1994), the emerging techniques of an evolving program were collected as a guide for other hearing centers considering cochlear implantation of children. In the 9 years since the first edition, implant technology has improved dramatically, and information regarding surgical and rehabilitation outcomes, as well as de-

velopmental data with implanted children, has greatly increased, thereby necessitating a second edition. Indeed, this second edition offers much to both hearing professionals and interested family members.

Assessing a child's preimplantation auditory status can pose significant difficulties, particularly for very young children with severe hearing impairment. Barry McCormick provides a comprehensive review of different methodologies used at Nottingham and elsewhere in his chapter, "Assessing Audiological Suitability Of Cochlear Implants For Children Below The Age Of Five Years."

Cochlear implant technology continues to evolve, and the latest implant and speech processor designs are adequately reviewed in the second chapter, "Cochlear Implant Systems," by Sara Flynn. Sound via the cochlear implant may be distorted (relative to the normal-hearing experience), but in the case of the developing auditory system, neither the degree of perceived distortion nor its effects are well understood. In general, the same multichannel speech-processing strategies employed for adults are provided for children. There are additional difficulties, however, in ensuring appropriate stimulation levels and tuning the processor to achieve acceptable sound quality for a child. The chapter "Fitting and Programming the External System," by Yvonne Cope and Catherine Totten, covers a wide range of relevant issues regarding speech processor fitting for children.

In addition to audiologic evaluations, electrophysiological measures can provide objective measures of hearing loss (before implantation), implant functionality (during surgery), and device tuning (after implantation). With young children, it is difficult to fit a speech processor, as they may not reliably communicate if a sound is inaudible or too loud. However, it may be harmful to the child's auditory development if the speech processor is not tuned properly. Electrophysiological measures such as neural response telemetry can guide the fitting of the speech processor. Steve Mason's chapter, "Electrophysiological and Objective Measures," provides a good overview of the many measures used to assess implant recipients' responses to electrical stimulation.

The appropriateness of implant technology (originally developed for postlingually deafened adults) for profoundly deaf children is often approached by a medical model, as Sue Archbold describes in her chapter "A Paediatric Cochlear Implant Programme." The risks, costs, and efficacy of implantation are better understood by many medical professionals than the attendant social, educational, and even emotional effects. This lack of sensitivity to deaf issues contributed to the polarization of the deaf community, many of whom "do not see deafness as a medical condition requiring treatment, but as a linguistic and cultural identity." The Nottingham center's approach to cochlear implantation is decidedly broad-based and includes, as part of the implant team, medical professionals, speech therapists, educators, and most importantly, the child's family. This multidisciplinary approach is vital to the child's success with the implant. The family's role in this success cannot be underestimated.

Besides the family's responsibility in the seemingly endless logistics of the implant program (shepherding the child to the many appointments with audiologists, surgeons, therapists; making sure the child wears the device; ensuring that the device is working properly and obtaining repairs; etc.), the family plays a pivotal role in the auditory rehabilitation of implanted children. The Nottingham center has developed a number of age-

appropriate rehabilitation methods in which the family participates. Actually, as authors Sue Archbold and Margaret Tait point out in their chapter "Facilitating Progress after Cochlear Implantation: Rehabilitation—Rationale and Practice," *habilitation* may be the more appropriate description for a child's auditory development with a cochlear implant. To enhance this development, the Nottingham center advocates "active learning" by the child, rather than strictly employing training techniques that are effective in the *re*-acquisition of speech and hearing skills. For young implant recipients, "incidental learning," in which games and activities include some sort of auditory reinforcement, may best promote auditory development.

The Nottingham group also makes use of video to monitor children's progress, as described in another chapter by Margaret Tait. By incorporating video analysis in longitudinal outcome studies, researchers found that implanted children were able to develop speech production that was similar to better hearing aid users; however, the implanted children were able to achieve these levels more quickly than hearing aid users. Video was also useful in predicting children's pre- and postimplant performance. The Nottingham group uses other measures to assess children's progress, as described in Dee Dyar's and Thomas P. Nikolopoulos' chapter, "Monitoring Progress: The Role and Remit of a Speech and Language Therapist." Because cochlear implant outcomes remain variable and because of the added difficulty in measuring performance in children, standard assessment protocols are important in monitoring an implanted child's progress. The appropriateness, efficiency, and reliability of these protocols are important in determining each child's auditory, cognitive, and neurolinguistic level of performance, both before and after implantation.

In general, the book provides a strong overview of the many issues relating to cochlear implants and children. Of course, the impact of these issues will be most keenly felt by the children and their families. The book's final chapter, "Family Perspectives," by Hazel Lloyd Richmond, is especially insightful about the effects of deafness and implantation on the family dynamic. Through case studies and accounts written by the parents of implanted children, a wide range of emotional and psychological responses is presented, including the enormous stress felt by parents at the time of diagnosis, surgery, and initial hook-up of the implant. The decision to implant a child is in itself stressful, and many parents agonize about whether the implant is the best solution to the communication and social challenges their child will face in life. Fortunately, the Nottingham program's integration of the medical, therapeutic, education, and family communities provides a strong foundation, so that families can receive the support needed for successful outcomes. The Nottingham group's experiences with implanted children, along with the many recent studies cited in the chapters, will be invaluable guides in this continually developing area of research and clinical practice.

JOHN J. GALVIN III and MONITA CHATTERJEE
Department of Auditory Implants and Perception
House Ear Institute
2100 W. Third St.
Los Angeles, CA 90057