Multichannel Cochlear Implants in Children: An Overview of Experimental and Clinical Results.
Melbourne, Victoria, Australia.

During the last decade there has been great progress in the clinical management of profound, postlinguistically deafened adults through the use of multichannel cochlear implants. The device developed by Cochlear Pty. Ltd. in association with the University of Melbourne, electrically stimulates selective regions of the residual auditory nerve using an array of 22 Pt electrodes located within the scala tympani. A speech processing strategy has been developed to provide patients with both voice pitch, and first and second formant information. Following experimental safety studies and successful clinical trials, this device was approved for use in adults by the United States FDA in 1985. In 1990, following further miniaturization of the implant, the FDA approved the device for use in profoundly deafened children above the age of two years. The present paper presents an overview of our recent biological safety studies and clinical experience with cochlear implants in children, and discusses the likely future development of these devices.

Our biological safety studies were designed to evaluate the safety and design requirements of cochlear implantation in children, and more recently has focussed on issues for implantation in very young children (< 2 years old). These studies included the measurement of growth in the human temporal bone and the development of leadwires that can accommodate such growth, the development of an electrode fixation technique close to the cochlea, the effect of cochlear implantation on skull growth, the effect of long-term electrical stimulation on the maturing auditory system and the stimulating electrodes, and the effect of middle ear infection on cochlear implantation. Our clinical experience is based on twenty-five children that have now been implanted in our clinic. They include (i) postlinguistically deafened children; (ii) congenitally or early-deafened young children; and (iii) congenitally or early deafened adolescents. Clinical testing has shown improvements in speech perception, speech production and language in all three groups. Postlinguistically deafened children show similar speech perception results to postlinguistically deafened adults. For the congenitally deaf, younger children tend to show better results than the adolescents. Significantly, these clinical results are consistent with results from 142 children obtained from clinics throughout the world.

These experimental and clinical results support the use of cochlear implants in young children. Further clinical improvements can be expected in the future with advances in both hardware and speech processing strategies.
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