

Cochlear Implants in Children

Cochlear implants are surgically implantable devices that can be used to help deaf children hear.

A cochlear implant, unlike a standard hearing aid, bypasses the inner ear structures and middle ear structures and stimulates the hearing nerve directly. Standard hearing aids are merely sound amplifiers. Cochlear implants are used when standard hearing aids have failed, usually because of the type and severity of the hearing loss. The implant produces sound that is different from normal hearing, but it is sound that for these children would not have been possible without the cochlear implant. As a result, a thorough screening exam is carried out prior to implantation.

Deafness in childhood affects more than a child's ability to hear. Language and speech development are hindered by the child's inability to hear their own voice and thus modulate it. Academic skills are highly dependent on the development of language skills and thus may suffer from a delay in its development.

Providing auditory input via a cochlear implant to a child early in life may help in minimizing or alleviating some of the developmental difficulties that result from deafness.

As a result, the early detection of hearing loss in children is paramount. It is the goal of neonatal intensive care unit high risk registries to screen infants at high risk for hearing loss. Early intervention is then possible in those children who are found to have a hearing loss.

Parents who feel that their child may have a hearing loss should have the child examined by an ear, nose and throat specialist, and the hearing tested as soon as the loss is suspected. There is no child too young to be tested.

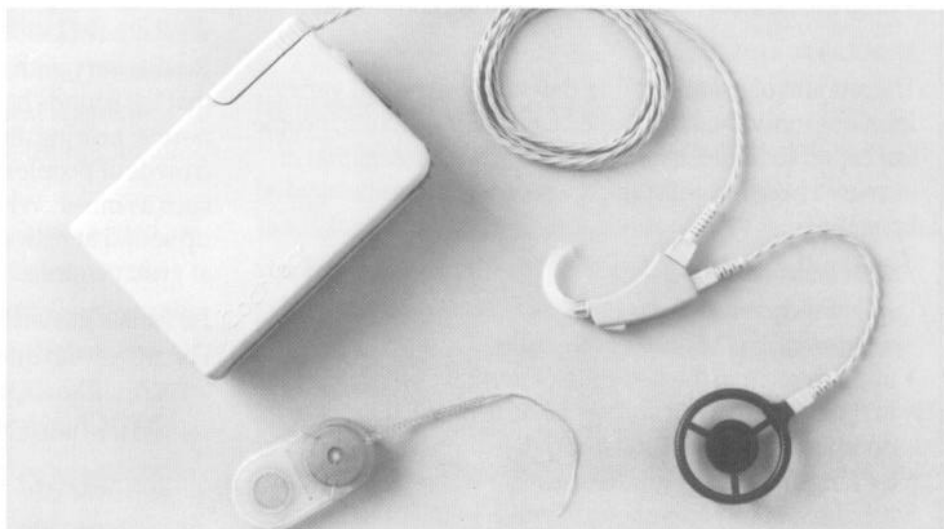
The amount of benefit derived from a cochlear implant varies from child to child. There are factors that can influence the success attained by the child.

In general, the greater number of auditory nerve fibers available for stimulation by the implant, the better the result. Those children who are deafened post lingually (after learning oral language) have the benefit of being able to connect the sounds from the implant and correlate these with their memory of sounds. Those prelingually deafened children do not have this benefit, and thus will usually take longer to develop oral language skills. Post lingually deafened children should be implanted as soon as possible after the onset of deafness to minimize the

time period during which there is no auditory input.

The most popular cochlear implant device (see Figure 1) consists of the surgically implanted multi-channel electrode and magnet, the external magnet and directional microphone which are connected to an external speech processor.

The system works as follows: Sound enters the system through a tiny microphone worn behind the ear that looks much like a conventional hearing aid. The sound is routed from the microphone to the external speech processing device, which codes the sound picked up by the microphone. The sound waves are transformed into electrical codes by the processor. These electronic codes are then transmitted through the patients' skin via the magnets and sent on to the previously implanted multi-channel electrode in the specific stimulation in the cochlea to



correspond to specific sounds picked up by the microphone. This entire process happens in just fractions of a second. This allows the cochlear implant wearer to hear sounds virtually as they occur. The multichannel device is FDA approved for use in adults and children alike.

The cochlear implant surgery consists of placing the multichannel electrode into the inner ear (cochlea) of the patient. This surgery is usually done by an otologist (a doctor who specializes in surgery and treatment of ear disease). The surgery usually takes two hours and patients usually spend a short recovery period in the hospital.

After the child has completely healed from the surgery (usually about six weeks), the cochlear implant device is programmed by a specially trained audiologist. The implant is essentially customized for each patient.

The origins of cochlear implantation research employed electronically simpler, single channel devices. In an

effort to drastically reduce the cost of cochlear implantation to closer approximate that of hearing aids; to simplify cochlear implant utilization, maintenance and fitting; and to develop a compact system without pouches or wires in a self contained unit, a resurgence in interest in these simpler single channel devices is occurring.

William F. House, one of the fathers of cochlear implantation and an EAR Foundation Medical Advisory Board member, currently leads an effort to develop a simple device which generates equally positive outcome for implanted patients. He has consistently maintained that the implanted patient's auditory environment is probably more important to the success of pediatric cochlear implantation than is the actual type of hardware which is implanted.

In a current FDA supervised study, selected implantation centers across the nation are investigating the use of a low cost, compact and cosmetically superior

device with these objectives in mind. A similar implantation surgery and rehabilitation protocol is followed as for the multichannel device. Both devices, in appropriate circumstances, have demonstrated great potential for hearing-impaired children. This is obviously an exciting time in the evolution of cochlear implantation.

The ability to hear sounds, develop improved speech, and speech recognition can all have a very positive effect on a child's life, both socially and academically.

The cochlear implant should not be regarded as "curing" a child's hearing loss, or the problems that can go along with it. Auditory training and education both in the classroom and at home are required after the implant is in place. With this assistance, most children are able to learn to use the sound from a cochlear implant and become successful cochlear implant users.

Cochlear Implant Questions and Answers

Those who:

- lack useful hearing in both ears
- cannot be helped by hearing aids
- were once able to hear
- do not have other serious medical conditions
- have support from others (family, friends)
- desire to be a part of the general hearing community

The amount of useful hearing that can be expected varies from one individual to another. Generally speaking, people can expect to understand more through a combination of increased hearing ability and faster, more accurate lipreading.

Implant recipients have:

- a restored level of auditory sensation.
- improvement in the detection of normal everyday sounds in their environment such as a knock on the door or a doorbell, car motors, and horns, telephones ringing, dogs barking and background music.
- increased ability to recognize speech with lipreading.

- limited improvement in the recognition of environmental sounds without contextual cues.
- the ability to make limited use of the telephone when speaking with a familiar person.

It is not simply an amplification device, such as a hearing aid.

Results vary with individuals and it is important to realize that the sounds heard will not be the same as those with normal hearing. Furthermore, it may be difficult to hear in crowds of people or with a great deal of competing sound such as music. While the microphone is capable of picking up sound at reasonable distances, it is not suited for hearing at great distances.

For answers to questions which you may have, write to:

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Or Call 1-800-545-HEAR

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