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## **Cochlear Implants**

### **What is a cochlear implant?**

A cochlear implant is a device that provides direct electrical stimulation to the auditory nerve. In sensorineural hearing loss where there is damage to the tiny hair cells in the cochlea, sound cannot reach the auditory nerve. With a cochlear implant, the damaged hair cells are bypassed and the auditory nerve is stimulated directly. The cochlear implant does not result in "restored" or "cured" hearing. It does, however, allow for the perception of sound "sensation."

### **How does a cochlear implant work?**

Cochlear implants have external (outside) parts and internal (surgically implanted) parts.

#### External Parts

The external parts include a microphone, a speech processor, and a transmitter. The microphone looks like a behind-the-ear hearing aid. It picks up sounds - just like a hearing aid microphone does -- and sends them to the speech processor.

The speech processor may be housed, with the microphone, behind the ear or it may be a small "box" worn in a chest pocket. The speech processor is a computer that analyzes and digitizes the sound signals and sends them to a transmitter worn on the head just behind the ear.

The transmitter sends the coded signals to an implanted receiver just under the skin.

#### Internal parts

The internal (implanted) parts include a receiver and electrodes. The receiver is just under the skin behind the ear. The receiver takes the coded electrical signals from the transmitter and delivers them to the array of electrodes that have been surgically inserted in the cochlea. The electrodes stimulate the fibers of the auditory nerve and sound sensations are perceived.

### **Where does one receive a cochlear implant?**

There are various cochlear implant centers around the country. Teams of professionals work together with adults and children from start to finish. Team members include an audiologist, otologist/surgeon, medical specialists as needed, psychologist, counselors, and speech-language pathologists. They work with potential candidates and their families to determine candidacy for an implant, perform the surgery, and provide follow-up care both through the center and through local agencies or school districts near the cochlear implant recipient.

### **What is the process?**

Once a person is referred to the cochlear implant center extensive testing is done to determine whether the person is a suitable candidate. This evaluation usually includes extensive audiologic testing, psychological testing, examination and tests performed by the surgeon, X-rays, MRIs, physical examination, and counseling to ensure suitability and motivation to participate in the process. It is important that the candidate understands what the implant will and will not do and also understands the commitment required for care and follow-up services.

Once the decision is made to go ahead, the surgery is done. Sometimes it involves an overnight stay in the hospital, and sometimes it is done on an out-patient basis.

About 4-6 weeks after surgery, the person returns to the center to be fit with the microphone and speech processor and to activate and program (called mapping) the implant. The initial fitting process is done over several days and may include additional visits over several months. The reason is that, as each electrode in the cochlea is activated, it must be adjusted and programmed into the speech processor. As the person develops skill in using the implant, further adjustments and reprogramming is required. Once the optimum program is obtained, fewer visits are required. Usually there are annual visits to the center for checkups.

Both children and adults receive extensive rehabilitation services from audiologists, speech-language pathologists, teachers, and counselors as they learn to listen, improve speech, use speech-reading, and handle communication. They are taught how to use the implant and how to respond to the sounds they are receiving. For those who have heard before, sounds through the cochlear implant may seem unnatural at first. Those who have never heard must be taught what the sounds are.

### **Who is best suited for a cochlear implant?**

Research is constantly providing new information and technology resulting in changes in cochlear implant procedures and instrumentation.

It is generally agreed that the best adult candidates are those who:

- Have severe to profound hearing loss in both ears
- Have had limited benefit from hearing aids
- Have no other medical problems that would make the surgery risky
- Have a strong desire to be part of the hearing world and communicate through listening, speaking, and speechreading

Children can also be candidates for cochlear implants. Children as young as 14 months of age have received cochlear implants, and the potential exists for successful implantation at younger ages.

It is generally agreed that the best child candidates are those who:

- Have profound hearing loss in both ears
- Can receive little or no useful benefit from hearing aids
- Have no other medical conditions that would make the surgery risky
- Are involved (when able), along with their parents, in all aspects of the informed consent process
- Understand (when able), along with their parents, their individual roles in successful use of cochlear implants
- Have (when able), along with their parents, realistic expectations for cochlear implant use
- Are willing to be involved in intensive rehabilitation services
- Have support from their educational program to emphasize the development of auditory skills