

Misha Madore  
University of Rhode Island Department of Biomedical Engineering

In the United States today, there are over 300,000 people with cochlear implants. They are people who were born deaf or severely hard of hearing, or the elderly who have lost their hearing capabilities to age and general deterioration. The cochlear implant itself is a small, complex electronic device that is placed both inside and outside the ear. The external part consists of three parts. A microphone, which picks up sound from the environment; a speech processor that selects and arranges sounds picked up on the microphone; and a transmitter and receiver/stimulator, which receives signals from the speech processor and converts them into electric impulses. The inner, surgically placed, implant is an electrode array, which is a group of electrodes that collect the impulses from the stimulator and send them to different regions of the auditory nerve. That is what distinguishes a cochlear implant from a hearing aid. The hearing aid simply amplifies the sounds coming into the ear while cochlear implants bypass the damaged portion of the ear and directly stimulate the auditory nerve. In this respect it proves that the cochlear implant requires intensive post manipulation therapy in order for individuals to relearn how to hear. They are not as good as normal hearing. However the cochlear implant can give a deaf person a useful representation of sounds in the environment to help him or her understand the speech that is going on around them. This is especially useful when it comes to emergency sounds.

Anyone who is deaf or severely hard of hearing can receive a cochlear implant. Adults tend to receive implants after age deterioration has set in, and they can no longer hear well enough to function in normal, day to day, society. For adults, relearning how to hear is a complicated process. As the cochlear implant does not replicate normal, perfect hearing, adults tend to associate a signal from

the implant with sounds they remember from their hearing days. This helps reduce the dependency on lip-reading and sign language. Children tend to receive cochlear implants between the ages of two and six. This has shown to greatly improve deaf children's ability to "hear", that is to understand and interpret sounds in their world. Early implementation provides great exposure to sounds that can be helpful during the critical period where children learn speech and language skills.

Cochlear implants require both a surgical procedure and significant therapy to relearn the sense of hearing. Insurance will sometimes cover the cost. The future of cochlear implants looks bright. Scientists are looking to see if it is possible to use a shortened electrode array inserted into a portion of the cochlea, for individuals with hearing loss limited to higher frequencies. Researchers are looking at the benefits of pairing a cochlear implant with another implant or a hearing aid in the other ear to see if that can give greater clarity to the sounds heard. Scientists are always looking for a way to better the sounds produced by the cochlear implant. As cochlear implementation is surgery, there can be risks but they are very minimal.

Sources

<http://www.nidcd.nih.gov/health/hearing/coc h.asp>

<http://www.isvr.soton.ac.uk/soecic/XSC-EARC.jpg>