

## Cochlear Implant



### Overview

The cochlear implant is an electronic device that can provide a sense of sound to a person who is deaf or profoundly hard-of-hearing. This type of device is very different from a hearing aid, which serves only to amplify sound. A cochlear implant transforms sounds into electrical signals and transmits these signals directly to the auditory nerve of the inner ear, bypassing any damaged structures in the ear that are impeding normal hearing.

### Parts of the Device

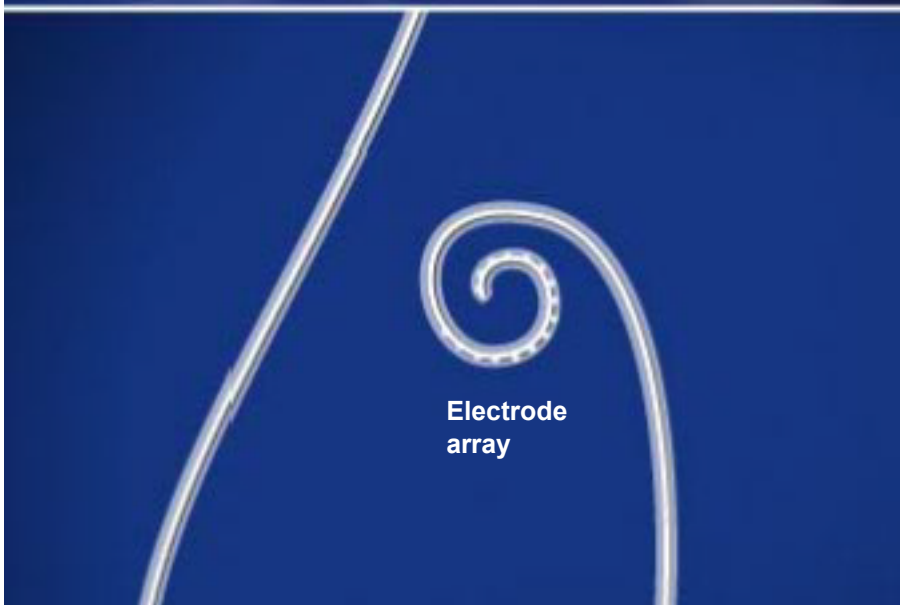
The cochlear implant uses a combination of external and implanted parts. The two main parts are the external speech processor (which is connected to a transmitter), and the internal receiver (which is connected to an electrode array.)

### External Speech Processor

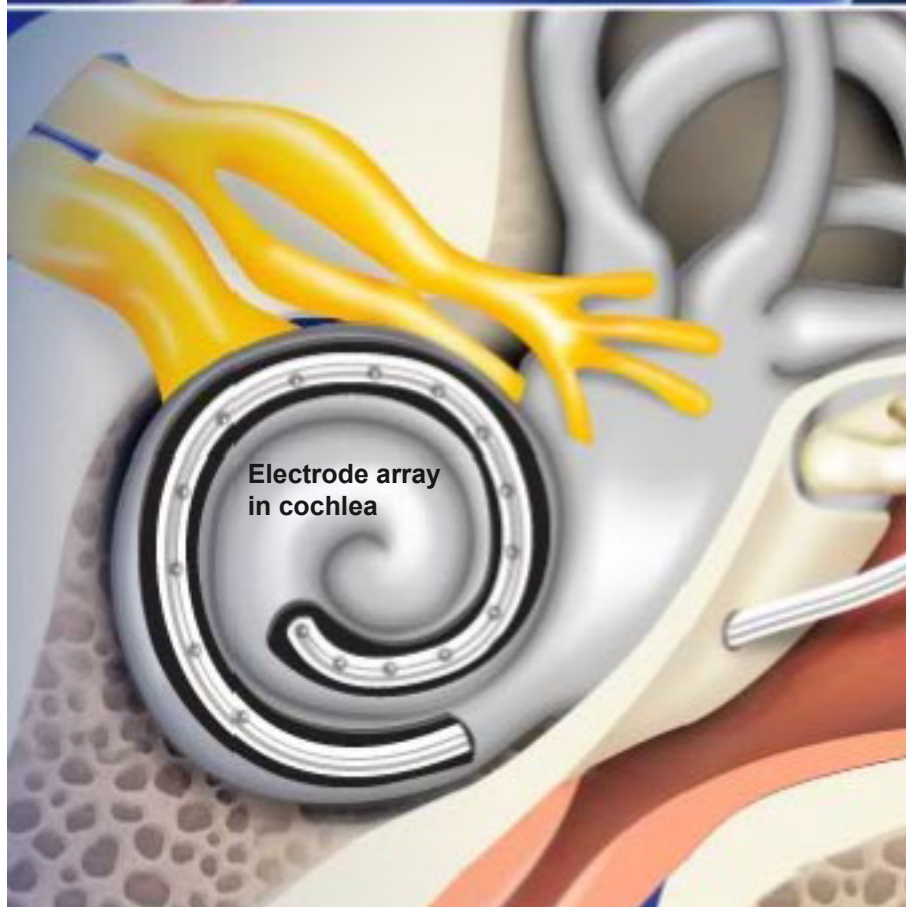
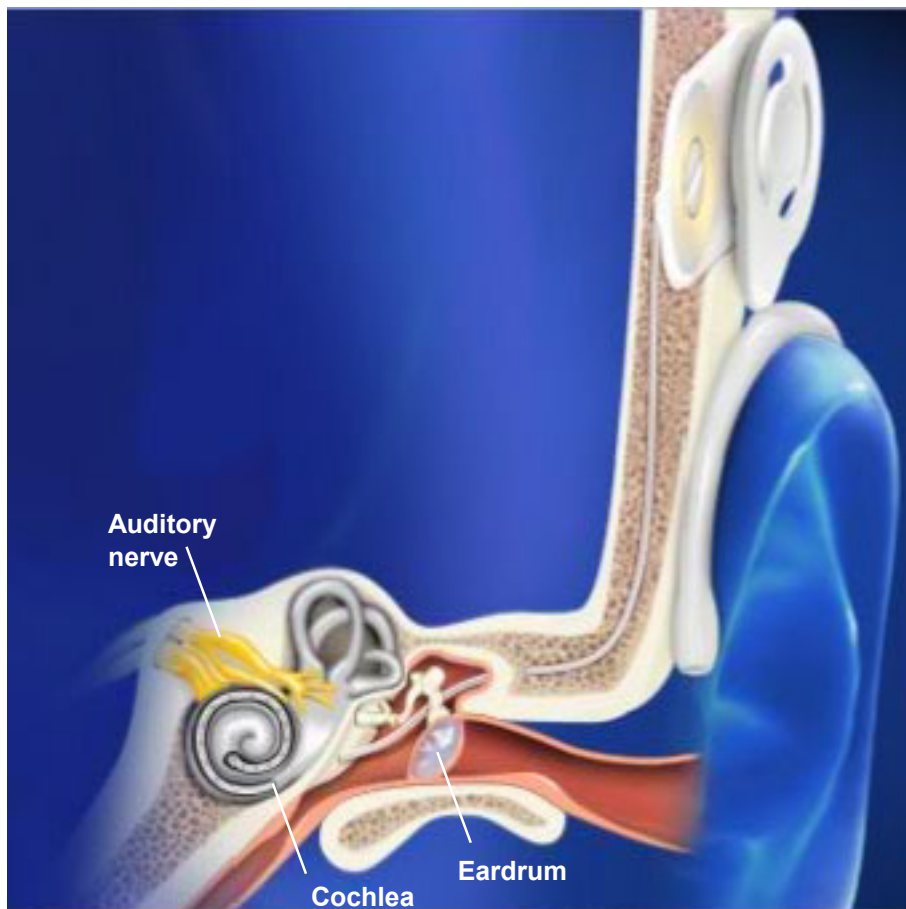
The external speech processor contains a microphone (for picking up the sounds that a person would normally hear) and a speech processor (which digitizes these sounds and sends them as electrical impulses to the transmitter coil). The transmitter is positioned externally on the scalp above the receiver. It is held firmly in place with a magnet. The transmitter sends power and processed sound impulses via a radio signal through the skin to the internal receiver.

### Internal Receiver

The internal receiver is implanted beneath the scalp in a hollowed-out depression created in the mastoid and retromastoid area of the skull. The internal receiver collects the signals from the transmitter and relays them along a cable to an electrode array. The electrode array is a tiny coil of electrodes that is wound inside the spiral-shaped cochlea of the inner ear. The array passes the sound impulses directly to the auditory nerve, which carries the signals into the brain.



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### Implanting the Device

Cochlear implant surgery, performed under general anesthesia, typically takes about one hour. The surgeon shaves a portion of the hair of the scalp and creates an incision in the skin behind the ear. A small depression is created in the bone, forming a space that will hold and protect the receiver. The surgeon then drills through the skull to reach the cochlea of the inner ear, where the electrode array is carefully implanted. Once the components are securely attached and anchored, the skin is folded back into place and the incision is closed. Patients typically return home that same day.

### Activation

After the procedure, the patient will visit with a cochlear implant audiologist to have the implant activated and calibrated. During the initial activation session, the patient is fitted with the external components, which are connected to the audiologist's computer. The electrode array is mapped and the processor is adjusted to provide sound at a comfortable level. Patients often describe the first sounds of the implant as cartoonish or robotic, but as the brain adjusts to the input, many patients find that they can soon interpret a wide range of sounds and speech.

### Life With a Cochlear Implant

A cochlear implant will not restore normal hearing, but it can allow a person who is deaf to hear again. Patients with cochlear implants are typically able to recognize individual voices and environmental sounds, and some may be able to recognize music. Results can vary widely depending on each patient's unique situation.