



COCHLEAR IMPLANTS AND HEARING AIDS

To understand the differences between cochlear implants and hearing aids, it helps to look at how each technology works and who they are intended to help.

HEARING AIDS

Hearing aids are a familiar technology to most people. They can help people with mild to moderate hearing loss regain much of their hearing ability. Modern hearing aids have many advanced features to make them more user-friendly and capable. Hearing aids work much like a microphone and speaker system in miniature format. A microphone picks up sounds in the environment around the user. The hearing aid then processes that sound depending on several factors, such as:

- The frequency of the sound
 - The level of background noise
 - The orientation of the sound to the microphone
 - The volume of the sound relative to other environmental noise
- Once the sound is processed by the hearing aid, the hearing aid's speaker sends it into the user's ear canal. This amplified and modified sound is easier for the ear to pick up than regular, unmodified sound. With hearing aids, people can hear frequencies and noise levels that they previously found difficult or impossible to hear. Hearing aids are best suited to people suffering from several conditions, including:
- Age related hearing loss
 - Noise-related or exposure related hearing loss, such as hearing loss caused by exposure to loud noises at work
 - Some types of ear damage such as certain cases of tympanic membrane perforation (perforated eardrum)

COCHLEAR IMPLANTS

Cochlear implants are a much less common and more complicated hearing technology than hearing aids. Hearing aids are devices worn in or on the ear that amplify sound, whereas cochlear implants are surgically implanted devices that interact directly with the deepest parts of the inner ear.

Cochlear implants work in a quite different manner than hearing aids. Where hearing aids amplify sounds so they can be heard, cochlear implants instead bypass the "hearing" parts of the inner ear entirely. Instead, they turn sound into electrical impulses and use those impulses to directly stimulate the auditory nerve. The

auditory nerve perceives these electrical signals as sound and transmits them to the brain.

The sound from cochlear implants is different than normal environmental sound. This is because the electronic signal sent by the implant to the inner ear cannot match the complexity of normal sound signals. Instead, the sound must be reduced to “channels” that drive electrodes at specific frequencies. Advanced cochlear implants can feature more than 20 channels with multiple electrodes per channel, allowing for a wide range of frequency responses.

Cochlear implants aren't suitable for the vast majority of hearing loss sufferers. They are invasive and require a lot of time and patience to use properly. However, they can provide a sense of hearing to people with no other option, such as:

- Children and adults with certain types of congenital hearing loss
- People with certain types of severe ear damage
- People with profound sensorineural hearing loss who can no longer benefit from hearing aids

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