AUDIOLOGY / OTOLARYNGOLOGY

OHSU Cochlear Implant Program

OHSU

Welcome to the OHSU Cochlear Implant Program

We are a team of passionate and professional cochlear implant specialists who want to connect you to the sounds and people around you. Our goal is to help people of all ages hear throughout life. The OHSU Cochlear Implant Program is the largest center for cochlear implants in the Pacific Northwest, part of Oregon's only academic medical center. At OHSU, we are dedicated to improving health and quality of life for all through excellence, innovation and leadership in health care, education and research. We firmly believe in the concept of the knowledge of all for the care of one.

We look forward to working with you or your child to explore the best treatment options.

The OHSU Cochlear Implant Team

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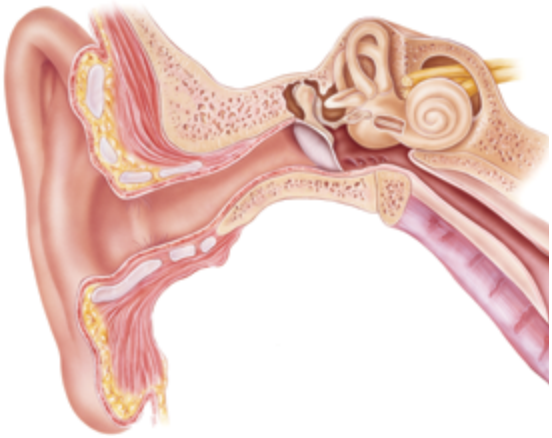
How do we hear?

The human ear has three parts: the outer, middle and inner ear. Each part has a role in conveying sound to the brain, which interprets sound and gives it meaning.



Outer ear

The outer ear consists of the parts you can see: the pinna (what you hang your glasses on) and the ear canal.

Middle ear

The middle ear includes the tympanic membrane (ear drum) and the ossicles (ear bones). The tympanic membrane is a thin film which acts as a partition between the outer and middle ear. The ossicles are commonly known as the hammer, anvil and stirrup. The medical names for these tiny bones are the malleus (hammer), incus (anvil) and stapes (stirrup). These are the smallest bones in the body.

Inner ear

The inner ear has three main components: the cochlea, semicircular canals and the auditory nerve. The cochlea is a fluid-filled, snail-shaped structure lined with tiny hair cells. The hair cells sway in reaction to sound waves. When these move, they ignite a signal that travels up the auditory nerve for the brain to process. The semicircular canals are the body's balance center.

How hearing happens

Sound is a vibration that travels in a wave through the air. Hearing occurs when the sound waves enter the ear canal, hitting the ear drum. This vibration moves the middle ear bones, which transfer the energy to the hair cells in the inner ear. These hair cells send pitch-specific information to the hearing nerve. The nerve carries the signal to the brain, which interprets and attaches meaning to the sound.

What are the types of hearing loss?

Hearing difficulties relate to a problem in one or more of the three sections of the ears. The treatment and recommendations for hearing loss vary depending on which section of the ear is involved.

Conductive hearing loss

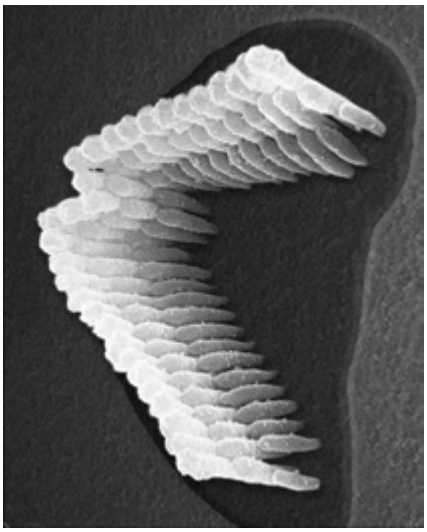
Conductive hearing loss is when sound can't pass through the outer or middle ear. Various problems, such as infections, can cause this type of hearing loss. People with conductive hearing loss should visit an otolaryngologist to determine if there is a surgical procedure that will improve their hearing. We can also treat conductive hearing loss with hearing instruments (hearing aids, etc.).

Sensorineural hearing loss

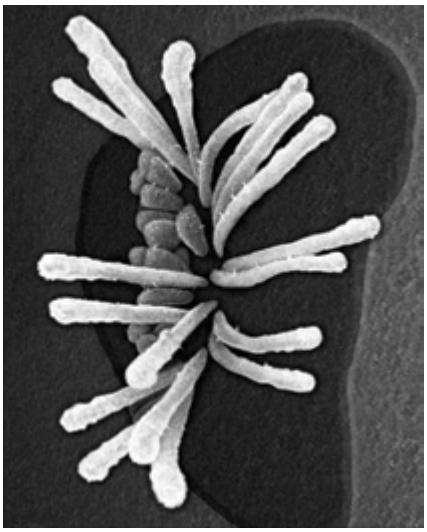
Sensorineural hearing loss is a problem of the inner ear, typically caused by damage to the hair cells. These cells are very delicate, and if damaged can decrease hearing sensitivity. Hearing loss of this nature is typically permanent and can be managed with hearing aids and other hearing instruments.

Mixed hearing loss

Some people have a combination of conductive and sensorineural hearing loss.



Healthy hair cells



Damaged hair cells

Hair cell images used with permission from the Dangerous Decibels program **www.dangerousdecibels.org**

What is a cochlear implant?

A cochlear implant is a surgically implanted device that bypasses damaged parts of the inner ear. By bypassing these damaged parts, a cochlear implant can provide better access to environmental and speech sounds. Factors such as duration of hearing loss, cause of hearing loss, duration of hearing aid usage and age can impact your performance with a cochlear implant.

There is an adjustment period where the brain adapts to this new way of hearing. Consistent device use and routine auditory training are important to optimize hearing with a cochlear implant. You should follow up with your audiologist routinely to maximize benefit from the cochlear implant.

Who is a cochlear implant candidate?

An individual with moderate to profound sensorineural hearing loss who has little to no benefit from hearing aids meets the qualifying criteria for a cochlear implant. It is also important that the individual has a clear understanding of the cochlear implant process and end results, and is committed to the process and to returning for follow-up appointments.

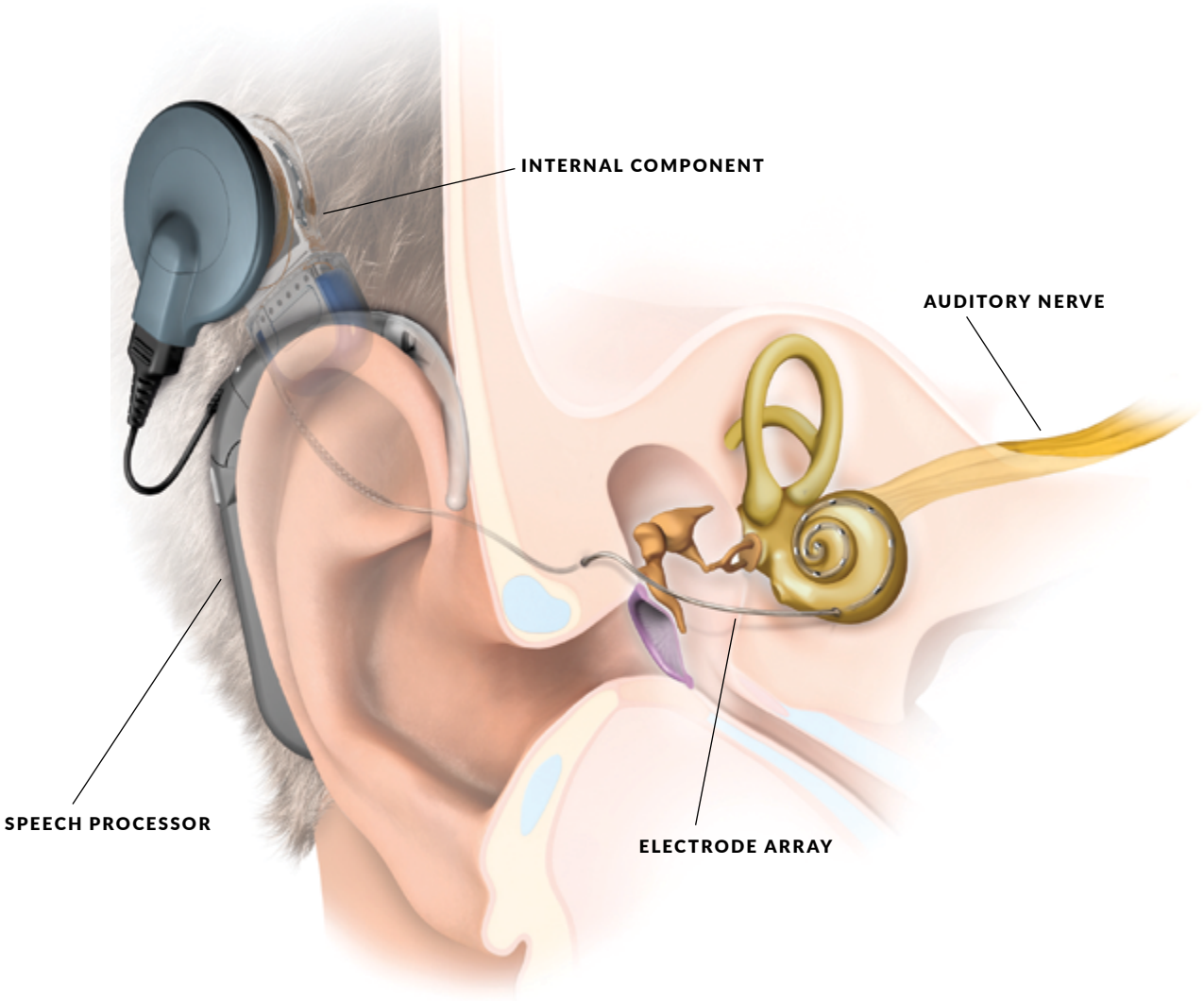
Cochlear implant design

Internal component

The surgeon implants the internal device and it resides completely under the skin. The surgeon will insert the electrode array through the middle ear space and into the cochlea. The internal piece also houses the receiver and one of two magnets. The magnets connect to the external processor, which transmits sound across the skin to the electrode array.

External component

The external component, also called a speech processor, is composed of microphones, a digital processing chip, a transmitting cable, coil and magnet. The processor is battery-powered and can use either disposable or rechargeable batteries.



What is the evaluation process for a cochlear implant?

At OHSU, we provide a comprehensive evaluation for potential cochlear implant candidates. Our goal is to determine which technology will provide the best hearing and communication abilities for you or your child. The evaluation usually involves at least two visits to your audiologist and surgeon.

Audiological assessment

A cochlear implant audiologist will conduct tests to evaluate your hearing, including how well you understand speech when using hearing aids. Both your degree of hearing loss and speech-understanding abilities are important to determine your cochlear implant candidacy. In addition to testing, the audiologist will also review the general function of the implant as well as discuss what you can expect from the cochlear implant based on your history. If your test results support recommending a cochlear implant, the audiologist will review device options from all cochlear implant companies.

Medical candidacy and functional hearing assessment

Part of the evaluation will include imaging, such as an MRI or CT scan of the inner ears. This information is valuable to the surgeon, who will consult with you on your medical or otologic history as part of determining your candidacy for the implant.

Additional assessments

You may need some additional assessments before receiving your cochlear implant. These may include a balance evaluation, aural rehabilitation, anesthesia evaluation or a psychological assessment of global development and cognitive function.

Receiving a cochlear implant

If you or your child is a candidate for a cochlear implant, we will request coverage information from your insurance for your implant expenses. Once the insurance provider approves coverage, we will contact you to schedule a surgery date.

Surgery

Cochlear implant surgery is a single-day procedure performed under general anesthesia. The procedure typically lasts two to four hours. The major risks of surgery include loss of residual hearing and balance disturbance, in addition to the general risks of anesthesia and infection. The implant surgeon will discuss the exact risks of surgery and will recommend vaccinations to prevent infection.

Recovery

Healing from this surgery generally takes two to four weeks, but most people are back to work within the week. The cochlear implant isn't activated during this recovery period. In a follow-up visit about two to four weeks after surgery, the implant surgeon will assess the incision site to clear you for activation of the cochlear implant.

Activating the implant

The audiologist will program your cochlear implant based on your responses and standard measurements. An individual's initial responses to sound are extremely variable and depend largely on your hearing history.

Follow-up

The brain adapts quickly to this new way of hearing, so we will need to make frequent adjustments to address changes in hearing. There are generally seven to eight appointments the first year after receiving the cochlear implant: initial activation sequence (four visits within the first month), three months, six months and one year post-activation. At each of these appointments, we will adjust the speech processor to help improve your hearing with the cochlear implant. The cochlear implant audiologist will also monitor the internal implant for safety. After the first year, we recommend a follow-up appointment annually.

Is a cochlear implant a covered expense?

In most cases, insurance companies cover most of the cost for the implant process, including the surgery, external speech processing equipment and follow-up appointments. However, there are some cases where insurance does not cover the implant expenses. This may be the case if you do not meet traditional criteria for a cochlear implant. Before surgery, we will get authorization from your insurance company, so you will know of any potential out-of-pocket expenses before moving forward with your implant.

Additional cochlear implant resources

Alexander Graham Bell Association (AG Bell)
www.agbell.org

American Cochlear Implant Alliance
www.acialliance.org

American Speech Language Hearing Association
www.asha.org/public/hearing/cochlear-implants/

Centers for Disease Control (CDC):
Immunization Recommendations
www.cdc.gov/vaccines/vpd/mening/public/dis-cochlear-faq-gen.html
www.cdc.gov/MMWR/preview/MMWRhtml/mm5231a5.htm

Food and Drug Administration (FDA)
www.fda.gov/medicaldevices/productsandmedicalprocedures/implantsandprosthetics/cochlearimplants/default.htm

Hearing Loss Association of America (HLAA)
www.hlaa.org/portland-chapter.html

My Baby's Hearing
www.babyhearing.org

Visit the OHSU Cochlear Implant Program website for more information.

www.ohsu.edu/cochlearimplant

Photo courtesy of Med-El

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