



Cochlear Implant

Introduction:

A cochlear implant is a computerized electronic system designed to help deaf or severely hard of hearing persons hear again. It works by providing electronic stimulation to the hearing nerves in the center core of the inner ear. It consists of an external microphone, signal transmitter, speech processing system and an internal stimulating system. The microphone picks up sound and sends it to a speech signal coding computer, called a speech processor. The speech processor creates and sends radio waves with coded sound information across the skin to an internal antenna. The internal system distributes the coded sound information to the residual hearing nerves in the internal core of the inner ear via a cable that the surgeon implants into the inner ear.

Eligibility

Persons with severe to profound hearing loss who also obtain little or no use from appropriately fitted hearing aids may be candidates for cochlear implants. The person must otherwise be in good enough health to tolerate a two to three (2-3) hour surgical procedure and must have no other mental or emotional problems that would impair learning or using the device effectively.

Candidate Evaluation

An audiogram determines if the hearing loss is so severe that hearing aids are unlikely to be of much benefit.

Speech understanding tests with and without an appropriately fitted hearing aids are done in a sound treated booth. Word understanding scores on these tests must fall below 50% word recognition for the better ear.

A CAT scan or MRI scan of the inner ears evaluates whether the anatomy will allow a cochlear implant.

A physician medical evaluation determines whether ones hearing and health are appropriate for surgery.

Other tests may be necessary depending on what the evaluation determines.

The audiologist and the physician meet to discuss and agree on cochlear implant candidacy.

The patient or patient's family if the patient is a dependent indicates which cochlear implant system each prefers.

Alternatives to Cochlear Implant Surgery:

Hearing aids are the usual alternative to a cochlear implant, but one is not a candidate for a cochlear implant unless function with a hearing aid is poor. A device that causes skin vibration in response to sound is possible, but availability and patient acceptance of vibrotactile devices is generally poor. Lip reading and sign language are also alternatives.

General Considerations:

Feel free to ask the surgeon to demonstrate the surgery pathway on a plastic skull. The surgery creates a seat for the internal receiver can in the skull behind the ear. Surgery opens mastoid bone immediately deep to the outer ear in order to create a pathway to the inner ear where the internal stimulating cable can be inserted into the inner ear, the cochlea.

MRI: after a cochlear implant, persons generally can not have MRI scans. MRI scans may ruin the cochlear implant magnet.

A cochlear implant can set off **Airport Security** equipment. Be sure to carry cochlear implant identification materials.

Patients receiving a cochlear implant should be aware of potential problems with **Diathermy:** Therapeutic or medical diathermy (thermo penetration) using electromagnetic radiation (magnetic induction coils or microwave) must not be used because these may cause tissue damage to the cochlea or permanent damage to the implant. Medical diathermy with ultrasound may be used below the head and neck.

Before Surgery

Avoid **Aspirin, Advil, Motrin, Aleve, Vioxx, Celebrex** and similar non-steroidal agents for at least five days prior to surgery, preferably two weeks. You may use Tylenol. Ask about other pain medication as needed.

Ask the doctor if any other medications will need to be changed ahead of surgery.

On the day prior to surgery, the patient meets with the surgeon to complete appropriate paper work. A trip to the hospital allows for blood work and a meeting with the anesthesia staff.

Arrive for surgery about two hours ahead of the scheduled surgery time. Surgery is completed under general anesthesia and takes about 2 hours. Expect to spend an additional 4-8 hours at the hospital after surgery.

After surgery, restrictions include:

Do not use aspirin, **Advil, Motrin, Aleve, Celebrex, Vioxx**, or similar non-steroidal anti-inflammatory medication for two weeks after surgery. These and other **arthritis medications may cause bleeding.**

You will be given prescriptions for pain medicine, antibiotics, and antibiotic ointment. Please use them as the prescriptions dictate.

No nose blowing for a minimum of two (2) weeks. Open mouth to **sneeze** for two (2) weeks. Do not stop a sneeze by squeezing your nose. Nose blowing may inflate the ear with air and create an air pocket around the cochlear implant and delay healing.

Use **petroleum jelly (Vaseline) coated cotton** to plug the ear to prevent water from getting into the ear until told otherwise.

You may **wash the incision** with soap and water. Coat the incision with **antibiotic ointment** twice a day for two weeks.

Expect to see the surgeon at two weeks after surgery. Electronic **tune-up of your cochlear implant** begins generally at **4-5 weeks after surgery** and continues weekly for several weeks. After the initial tune-up is complete, you and the audiologist will set up a schedule for additional testing and speech processor programming, usually every few months.

Resuming normal activities: Most patients are **dizzy** and have some **headache** after surgery. Resume **driving** and **return to work** when dizziness and/or lightheadedness have improved sufficiently and if your job activity fits within lifting restrictions, listed below.

Dizziness after surgery usually improves more rapidly the more active you are. **Avoid ladders, step stools, and unprotected heights** until you can move quickly in any direction without dizziness or lightheadedness. The more quickly you work back into normal routines, the more quickly you will feel better and energy will return. **Avoid lifting**, bending, and stooping for two weeks. Then avoid lifting more than 10 pounds until six weeks after surgery. Six weeks after surgery, you may resume normal lifting and other activity unless the doctor has indicated a reason to continue to avoid lifting.

General Risks of Cochlear Implant Surgery:

Chewing may be tender for a few weeks after surgery. **Numbness in the scalp** above and around the ear is common and may improve in time. **Dizziness** is common after surgery and usually improves within a few weeks. More persistent dizziness bothers some patients permanently. **Bleeding** or bruising on the side of the face may cause eye swelling and rarely requires a return to surgery for control. **ringing** in the ear is sometimes a noticeable nuisance after surgery, but may also be improved by surgery. **Loss of residual hearing** in the operated ear is expected. A **hearing aid** will not be an option on the operated side. **Taste** for sweet, sour, salt, and bitter on the side to front of the tongue may be altered by surgery and may not recover back to normal, but symptoms usually settle down within six months. Ability to smell is not affected by ear surgery. A **hole in the ear drum** is a possible rare side effect of surgery and may require additional surgery. **Infection or bacterial meningitis** may develop after surgery with a general risk of less than 1% of our experience. *If you think you have an infection, with wound swelling, wound drainage, fever, headache, stiff neck or other problem, call the doctor right away.* **Rarely, spinal fluid may leak** through the wound or through the mastoid bone into the nose. If you develop clear fluid leakage through the incision or nose, let the doctor know right away. If spinal fluid leakage persists, the surgeon may elect to place a spinal fluid drain into the lower back for a few days. If the drain does not solve the problem, more surgery may be necessary stop the spinal fluid leakage. **Weakness or paralysis** of the nerve that makes the face to smile is a rare side effect of cochlear implant surgery. A delayed onset facial paralysis can develop after leaving the hospital especially in persons with a fever blister history. The face recovers to normal or nearly normal in almost all cases, but, in rare cases, facial movement may be permanently impaired. **Facial quivering or pain** can be a side effect of cochlear implant stimulation that can usually be programmed out. **Device failure** is a less than 1% risk and may require more surgery to replace the cochlear implant. The device does have a **time limited guarantee**. While the device is designed to last a life time, it may become **obsolete** in comparison to newer devices under development. **Blood** transfusions are generally not needed, but would pose transfusion related risks (see the hospital blood transfusion informed consent form for more details). Anesthesia has its own risks that the anesthesia doctor will discuss with you. **General medical conditions** that affect the heart, circulation, breathing, and urination can all be aggravated by surgery of any kind.

Vaccination recommendations: Long term, patients who have had a cochlear implant have a slightly higher chance of developing bacterial meningitis. **Signs of meningitis** include headache, stiff neck, fever, and/or altered conscious. Meningitis may occur soon after surgery or months to years later. The risk can be reduced by having vaccines for the Pneumococcus and Haemophilus bacteria as follows: *Haemophilus influenzae* conjugate vaccines for all children up to age 5 years. Heptavalent pneumococcal conjugate vaccine (Prevnar) for in infants and for all children less than age 2 years, and for children up to age 5 years who are at high risk of invasive pneumococcal infections. The 23-valent pneumococcal polysaccharide vaccines (Pnu-Imune23 and Pneumovax23) are recommended for children over age 2 years, adolescents, and adults who are at high risk of invasive pneumococcal disease. For children age 2 years to 5 years of age who are at high risk of invasive pneumococcal infections, use a pneumococcal conjugate vaccine followed at least 2 months later by 23-valent pneumococcal polysaccharide vaccine, in order to provide protection against a broader range of serotypes, although supporting data are limited. See individual product labeling for information on dosing and scheduling of the vaccines.

Warnings:

After having a cochlear implant, **MRI scan** tests may damage the cochlear implant internal magnet. After an MRI, the magnet on the internal receiver may no longer hold the external antenna in place. Limited low strength MRIs may be possible and, eventually, MRIs with known resonance characteristics might be possible with some cochlear implant systems. MRI equipment resonance characteristics determine which types of MRI may have an adverse affect on the internal cochlear implant electronics.

Therapeutic or medical **diathermy** (thermopenetrations) using electromagnetic radiation (magnetic induction coils or microwave) may induce tissue damage inside the inner ear and ruin the cochlear implant. Medical diathermy with **ultrasound** may be used safely.

Patient/Guardian Statement: The patient or patient’s guardian and/or legal representative state by signing below that doctor has discussed the surgery, alternatives, and major risks, that the above information has been communicated to the patient, guardian, and/or legal representative and that an opportunity to ask questions has been given. The consent form should not be signed until the patient, guardian, and/or legal representative have obtained a layman’s understanding of the surgery and have obtained satisfactory answers to all questions. By signing the consent form, the patient, guardian, and/or legal representative indicate a layman’s understanding of the surgery, potential alternatives to surgery, and reasons for surgery and indicate a desire to proceed. If the surgery has been explained in another language, the person who has translated must indicate by cosigning the document that all information from the doctor and from this consent form have been communicated to the patient, guardian, and/or legal representative and that all questions have been answered satisfactorily.

Patient printed name			Patient/guardian signature		Date Signed
Circle Ear to be operated	R	L	Doctor: Loren J Bartels MD FACS	Date of Surgery	
Witness			Guardian or Reading Interpretor printed name	Translator/Interpretor	Language