

**Cochlear Implants**  
**ELE 282, Biomedical Engineering Seminar**  
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The idea of applying electrical stimulation to the auditory system is not a new concept. Volta made the first documented attempt in 1790; he stuck two metal rods in each ear and wired them to a circuit, this circuit produced approximately 50 volts. The sensation he got was described as a strong blow to the head followed by the sound of a boiling viscous fluid. It has been thought that this may have been why it took so long for someone else to seriously study the affects of electric stimulus on the inner ear. For years there would be very little progress in this field, some types of auditory aid would be invented but nothing that directly stimulated the cochlear nerve. But in the 1970's the foundations of the cochlear implant were created, although most people would benefit from an advanced form of a hearing aid at that time, the implant was a jumping off point for the technology. Now the implant is fully functional and can help people hear more clearly.

Unlike the hearing aid, which just amplifies sound into the inner ear from the outer ear, the cochlear implant bypasses the ear completely. It works as a replacement for the ear; the two basic parts of the system are: the internal device, which is the electrodes that connect to the cochlear nerve, and the external device, a microphone, a speech processor and the connecting cables.

The procedure is an outpatient procedure done in about three to four hours. The surgeon first makes an incision behind the ear and places a monitor for the facial nerve. The mastoid

bone is then removed along with an area of bone above the ear to make room for the device. The facial recess is then uncovered and a microscopic drill is used to open a path to the cochlea. The electrodes are then put in through the hole and the incision is partially closed so that the doctors can check to make sure everything is working correctly. After that muscle is packed around the wires and the electrode array to make sure that nothing moves. The internal device is then secured to its spot on the bone of the skull. The incision is then closed off and then the patient can go home. The programming of the device does not occur until four to six weeks after the surgery.

After the surgery the patient regains much of the lost hearing. The implant works best for people who have lost their hearing after they have learned to speak, although people who have never spoke can use and learn with this device, it is easier for those who have already learned to pick up from what they know than to try to learn from scratch.

Also there are many restrictions on who can be considered as a candidate for the surgery. Such as person must have little or no response to normal or advanced hearing aids. It is considered a last step treatment.

Sources:

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