Snail Tales: Cochlear Implants and Assistive Technology

Sharaine J. Rawlinson
Western Region Outreach Center & Consortia

Abstract

Would an individual with a cochlear implant (CI) qualify for DSS services? Can a CI user benefit from an assistive listening device? Should CI users avoid realtime captioning so that they will learn to depend on what they are hearing? Many misconceptions exist about the benefits individuals receive from CIs. While many CI users seem to return to a state of "near normal" hearing, others may gain little more than being able to identify sounds in the environment. Additionally, group discussions and hearing in noisy settings can still be problematic even for those with the most dramatic gains. This presentation covered the basics of CI technology, the range of benefits recipients experience, and accommodations that bring success on the job and at school.

{In this document, the author will provide – by way of explanation – some information about her own hearing loss and her cochlear implant use. The reader is advised that the cochlear implant modeled in this document is the model that she uses. It is not intended as an endorsement of any particular model of implant}.

Cochlear Implants

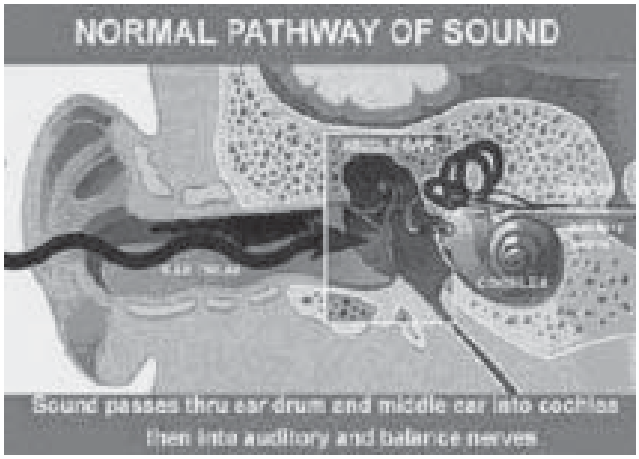
More than 40,000 people across the world have received cochlear implants, and a cursory study of the statistics here in the United States indicates that perhaps as many as 90% of all deaf children born today are receiving cochlear implants. Given this information, postsecondary educational institutions must anticipate the arrival of these students at their doors.

Cochlear implants (CIs) are called auditory prostheses. They do not restore hearing to normal; rather, they provide electronic sound. It is important to understand that CIs do not make a deaf person hearing. I am not hearing; if I remove my CI processor, I cannot hear you. I have tactile response at 110db and 117db in my ears. Without my CI, I can sit on an airplane and hear absolutely nothing.

Cochlear implants assist a deaf person who cannot benefit from traditional hearing aids. Often, at postsecondary institutions there can be some controversy about CIs amongst students who are hard of hearing and students who are deaf. CIs are a personal choice, and the decision to get an implant should be respected by others. Disability support service providers can help by educating students and instructors about the challenges that CI users still face in receiving auditory information.

Cochlear implants are designed to bypass the hair cells (cilia) that wave back and forth in the cochlea. The sound waves are sent to the auditory nerve, which – in turn – transmits them to the brain. When the cilia are damaged, they do not respond, and the process fails.

There are high and low frequency sections in the cochlea. When they start losing their hearing, many people lose the high frequencies first. Given that the high frequencies are at the base of the cochlea and closest to the outside of the cochlea, this makes sense. The base is more exposed than the inner point of the cochlea, the apex, where low pitches are created. {The image below is used with permission of Cochlear Corporation}.

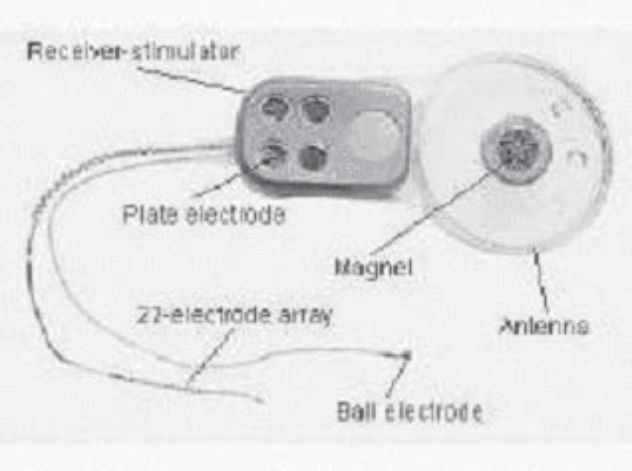


{www.earsurgery.org / cochlear.html}

I became deaf at the age of 14 from spinal meningitis. For 23 years, I only had tactile responses to very loud sounds. Many people who have had spinal meningitis cannot have a cochlear implant. Meningitis frequently

causes calcification, or a hardening, of the cochlea. I was one of the fortunate post-meningitis cochlear implant candidates that did not have any calcification or blockage in either of my cochleas.

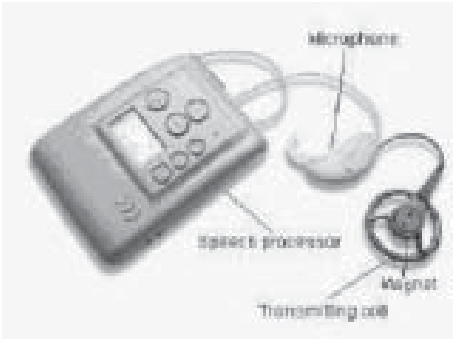
This following illustration is of the CI's internal component:



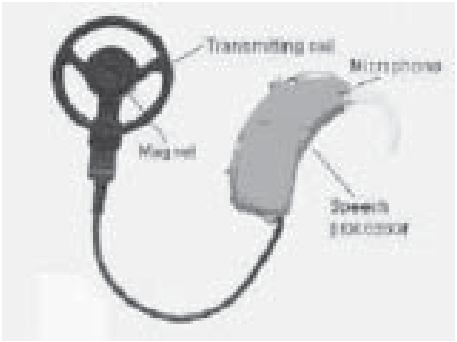
{Used with permission of Cochlear Corporation}

One wire goes through the cochlea, and the other serves as a ground wire. The longest wire has 22 electrodes, and the short one has two. Grounding helps to prevent shock from static electricity or other electrical sources.

Here is the external component in two different models {used with permission of Cochlear Corporation}:



SPrint Processor by Cochlear Corp.



ESPrit Processor by Cochlear Corp.

The microphone is located on a piece that hooks over the ear. It picks up the sound and sends the sound to the processor. There the processor creates electrical stimulation that is sent to the transmitting coil, which is attached to the antennae by magnets. The transmitting coil then sends the signal to the antennae. From here, the information goes to the receiver / stimulator, which stimulates the implanted electrodes to send messages in the form of electronic signals to the brain.

The old cochlear implants of the 1800s required jacks surgically implanted in the user's head. Today's CIs stay connected by magnets, and no plug is necessary. After a 5-6 week recuperation period, a person is hooked up (implants cannot be connected until the incision is healed). Mapping, as it is called, takes hours while the implantee sits with an audiologist and s / he programs each electrode individually. The first day of mapping requires about eight hours and is very tedious. The implantee hears only one tone at a time – not a full sound spectrum –until the end of the day when the audiologist puts it all together.

Some people will choose speech and auditory rehabilitation / habilitation. Their brain must be taught how to hear again or, in some cases, for the first time. Babies hear in the womb. Once babies go home and monitor the world around them, they will start to mimic sound. This is how their brains learn to hear. Babies' first spoken sounds are their efforts to mimic what they hear. Deaf children do not have these auditory memories. In order to benefit at all from a cochlear implant, they must go through a lot of training.

While most people will be able to identify environmental noises with their implants, the ability to understand speech sounds with ease varies from person to person. As stated above, one important factor is the age of onset of deafness. Those who are postlingually deaf will likely gain the ability to hear a lot.

At the time I was hooked up, so to speak, to my implant, I recall another individual doing the same that day. We were both implanted at the Mayo Clinic in Rochester, Minnesota. When he was connected, his wife said, "Can you hear me?" He said, "Yes, please don't shout." Years of living with a man who had a severe hearing loss had trained the wife to speak much louder than normal when addressing her husband. The implant gave them both a mechanism by which less effort is needed for them to communicate with one another.

For me it was different, it took time to learn to hear again. I had lived in absolute silence for 23 years. It took me months of practicing before I could understand words without looking at the speaker. Even today, five years later, I learn new words and hear new sounds daily.

When disability support service providers are working with a student who has a cochlear implant, it is appropriate to ask if the student wants a sign language or oral interpreter. I still use sign language interpreters. However, a larger percentage of people with cochlear

implants may not know sign language. For them, other accommodations would be appropriate.

Even while sitting in the classroom with a clear view of the professor, the student will usually still need to use a notetaker. While the student may understand some or even much of what is being said via the use of their cochlear implant, listening is very hard work, and it can be exhausting.

The classroom lighting is also important. I have experienced meetings where the lighting was terrible. Even with phenomenal technology providing incredible access, the poor lighting resulted in eyestrains, headaches, and body aches. Lighting is important for a deaf student, but it can also be said that the lighting is important for everyone. Many accommodations that we supply for disabled students benefit non-disabled students as well.

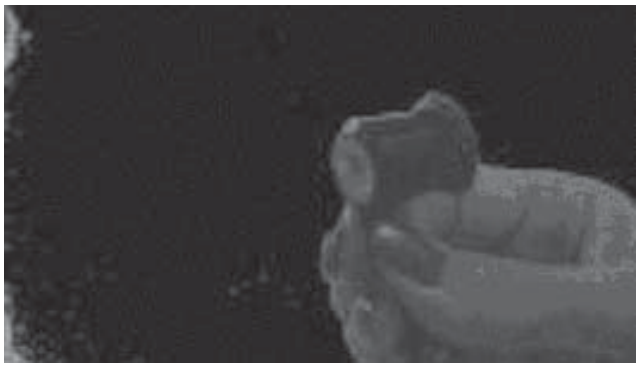
Assistive Listening Devices

Many disability support service providers today will also deal with assistive listening devices (ALDs). There are many different types of ALDs available for use with phone, TV, or a live lecturer or speaker. These are very helpful to hearing aid users as well as CI users; both types of users will experience problems hearing due to background noise (the implant or hearing aid will pick up the background noise, making it very difficult to understand what is being said) or in rooms with poor acoustics. Typically, the listener plugs in headphones or some other listening device into a pager-size receiver. There is a volume control that can be used to provide the amplification required (similar to using headphones with a Walkman®). For the individual with a CI, instead of plugging in headphones, a patchcord (a cord with jacks on both ends) connects the ALD receiver to the CI processor. The electronic signal is sent to the processor, and the processor sends the signal to the implant. This process bypasses the implant microphone and sends electronic signals directly to the processor. In the picture below, a PockeTalker® is patched into the implant processor. In a noisy restaurant, for example, the user's dinner companion would speak into the PockeTalker® microphone. This affords direct communication with the processor, reducing the amount of background or ambient noise that is allowed to enter the processor and, thus, greatly improving the hearing spectrum of the implantee.

©Sharaine Rawlinson & Cheryl Davis 2002
PockeTalker® connected to processor with patch cord

The same thing can be done with a Walkman®. Again, using a patch cord instead of a headset, the Walkman® can be connected to the processor and send music or radio directly to the processor. When using the patch cord, the microphone is automatically blocked, and sound is entering the cochlear implant only via the patch cord connected to the ALD or Walkman®.

FM and infrared systems that are often used in classroom and other lecture situations provide the same benefit to CI users as hearing aid users. They allow the individual to receive direct information from the speaker in a classroom. Different styles of microphones that work with the ALDs, such as conference microphones, can also be used with CIs. (In fact, CIs come with an extra hand-held microphone that can be plugged into the processor, basically turning the CI into it's own PockeTalker®-type ALD.)



©Cheryl Davis
2002 Telecoil Pick-up

©Cheryl Davis 2002
Telecoil Attachment

Hearing aid users often use the telecoil option (T-coil) on their aids to help them hear over the phone, to use in an area that has been specially looped for sound (via induction), or to use with ALDs instead of headphones. (For more information about T-coils and induction loop systems, see the training module *Demystifying Assistive Listening Devices* under "Training Materials" at http: / / www.wou.edu / wrocc.) CIs may also have T-coils

built in or have attachments that will allow the CI user to take advantage of induction technology and to hear better on the phone. The one pictured with the suction cup attaches to the hearing aid compatible (HAC) phone handset, and the jack is plugged into the processor. It picks up the magnetic field from the phone and sends the signal to the processor. The other one is a telecoil encased in plastic. It, too, would plug into the CI processor, and the coil end can be clipped to the user's clothing. If the room is looped, a hearing aid user would switch their hearing aid from "microphone" to "T-coil". The CI user would simply plug in the external T-coil.

No matter what the transmission mode of the ALD (infrared, FM, or induction) it can be plugged into the processor – as long as the appropriate patch cord is available, that is. Any time users plug the CI into a device that is AC powered (e.g., the TV, computer, stereo system), they must make sure that they are using a patch cord that has a built in attenuator. Some devices will send more power to the CI than it can handle. The attenuator restricts the power sent into the CI, thus preventing damage to it. Users can check with the CI manufacturer or dealers of assistive listening equipment to be sure that they are getting a patch cord with the right size jack, that the jacks match the plug-in (stereo or mono), and that it includes an attenuator if the equipment is running off of something other than battery power.

The difference for the CI user is phenomenal. I have been asked if I prefer to use the conference mike and an FM system or to listen on my own. I find that easy to answer: I, most assuredly, prefer the ALD connected to the conference microphone. It results in such clear speech; it is amazing!

Similarly, I visited an Effective Communication Solutions' booth and was able to try their stethoscope using my patch cord. I could hear my heart for the first time since 1974! These are the kinds of incredible technologies that are available to supplement and enhance the positive education experiences of today's postsecondary students.

©Sharaine Rawlinson & Cheryl Davis 2002
Processor with ALD Plug Inserted

©Sharaine Rawlinson & Cheryl Davis 2002
Processor with Telephone Link Connected

Captioned videotapes and / or programs are important in the classroom of a student with a cochlear implant as well. PEPNet provides a resource listing businesses that caption videotapes (pre- and post-production). Some states, such as Minnesota, now have a state law that requires all educational videotapes to be captioned.

For more information, please visit the WROCC and PEPNet websites at http: / / wrocc.csun.edu and http: / / www.pepnet.org; these organizations will be continually adding information on cochlear implants over the next four years.