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Cochlear Implants

Cochlear implants (CI) are designed to provide a person access to acoustic information while completely bypassing the normal route of sound transmission to the cochlea. They accomplish this by directly activating the nerve fibers normally stimulated by sounds traveling through the middle ear and into the cochlea.

Cochlear implants are intended for people whose natural hearing, even under optimal hearing aid conditions, provides less functional auditory capabilities than what is generally achievable through an implant.

Cochlear Implant Advances

The first cochlear implants were single channel devices that could convey only the most basic of auditory dimensions, i.e. the presence or absence of sound and some varied loudness sensations. In spite of their limitations, many people, particularly late-deafened adults, found that a cochlear implant could be very helpful. With an implant, users could hear and differentiate between some environmental sounds.

Speechreading skills were enhanced because of the additional auditory information, and more effective vocal monitoring of one's own speech was now possible. During this period, implants were not generally considered a viable possibility for pre-lingually deaf children or adults.

Since that era, and at the time of this writing in 2007, the technical advances in cochlear implants have been rapid and noteworthy. These advances reflect contemporary scientific accomplishments in electronics and microprocessors as well as an increasing depth of knowledge in auditory physiology. The current generation of implants benefited from these developments and are fully capable of permitting many, if not most, users to understand speech solely through hearing. Improvements in the hardware have been accompanied by parallel developments in speech processing algorithms.

Additionally, there are ongoing research programs in countries all around the world devoted to further increasing the effectiveness of cochlear implants in both the hardware and software. Other research studies are focused on the actual listening performance of implant users over extended periods of time, as well as examining and comparing the results of newly introduced speech processing strategies and devices. In short, there is no doubt but that cochlear implants devices are well grounded scientifically; they no longer can be considered

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experimental or unproven devices. Thus, they have taken their place in the armamentarium of aural rehabilitation devices routinely available for people with hearing loss.

Realistic Expectations

It should be clearly understood, however, that even under the best of circumstances a cochlear implant cannot, and does not, replace the natural auditory structures and normal physiology. A cochlear implant is not an “ear replacement.” Anybody considering an implant, for themselves or their children, will be disappointed if they enter the process with this expectation in mind.

What implants can and have done is permit acceptable auditory *functionality* in many situations and for many purposes (oral communication, telephone conversations, auditory-verbal development, etc.). The CI can permit a user to move from a functional deaf category, with all that this implies, to one who is able to function as a hard of hearing individual. In real-life this can make an immense difference.

Three Groups of Potential Candidates

Late-Deafened Adults

There are three general groups who are potential candidates for a cochlear implant.

The first, and largest group are late-deafened adults, those who grew up with normal auditory capacities but who later developed a severe to total bilateral hearing loss. This is a group that is fully aware of how the loss of hearing has impacted upon the totality of their lives (social, cultural, economic, etc.). It is also the group that has the best prognosis because they have a lifetime experience with sound (either naturally or through hearing aids) and thus the sound sensations received via an implant can benefit from intact auditory memories.

As adults, this group is ultimately responsible for making for themselves the decision whether or not to acquire an implant. Hearing Loss Association of America (HLAA) strongly advises, however, that the decision to acquire a cochlear implant be made only after consultation with the professionals in a cochlear implant center. It is their responsibility to review the possibilities and limitations of cochlear implants for specific individuals. Then, armed with this information, potential implant candidates can make a more informed decision. .

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Pre-Lingual or Adults with Long-Standing Hearing Loss

The second general group is also composed of adults, but those with pre-lingual or extremely long-standing hearing losses. This is a group that has not employed sound as their primary communication channel. On the contrary, they employ some visual form of communication, either sign language or speechreading, for this purpose.

Because of the potential consequences of long-term auditory sensory deprivation, their prognosis is more guarded than the first group. Their auditory memory is essentially absent or extremely limited and they may display some degree of neural atrophy in portions of the eighth nerve. Nevertheless, many people in this group have also opted to acquire a cochlear implant.

Generally, while not as dramatic as is often found in the late deafened group, adults in this category have also made significant progress in auditory awareness and speech perception. Further, the evidence suggests that slow, but steady auditory-verbal progress can continue to be made over the years for people who fall into this general category. As adults, they are also ultimately responsible for making their own decision regarding the acquisition of a cochlear implant.

As with the first group (late-deafened adults), HLAA recommends that adults falling into this category consult with the professionals in a cochlear implant center before making a final decision.

Pre-Lingually Deafened Children

The final group is primarily composed of pre-lingually and early deafened children. This is a group for whom the decision to acquire an implant is made for them, almost always by their parents. It is the parents who bear the responsibility and the authority to make such a decision for their child -- and it is a difficult one. It is a decision that should be made in cooperation with both the professionals who have been providing care for the child as well as with the professionals associated with a cochlear implant center.

Parents need to hear about all the educational, treatment and communication options available for their child. Deaf parents might have a different view of the need for and potential advantages of a cochlear implant and this must be respected. Most hearing parents would have an understandable desire for their children to be part of the same community that they belong to, and this also must be respected.

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Before the decision to implant a child is made, there needs to be assurance that the child cannot benefit from hearing aids to the extent possible with cochlear implants (as determined by the current research). This requires that the child receive, either directly or via the parents, an appropriate auditory-verbal training program while using carefully selected hearing aids.

Until recently, the decision to implant a child would not be made until he or she was two years old. Now, in order to engage in a developmental rather than a remedial therapy approach with the child (taking advantage of normal child development), the trend is to implant children at younger ages. There still needs to be confidence that the child's hearing loss is severe or greater, and that an appropriate trial with hearing aids was first undertaken.

It should be noted that generalizations regarding implants for children are even more difficult to make than with adults. It may be difficult with children to determine audiological candidacy for an implant at the age for which it is most desirable. Information about degree of hearing loss and auditory-verbal status may be sketchy at best with very young children. Additionally, more so than with adults, a child's progress is tied to the nature of the training program he or she receives and the commitment of both the parents and the professionals to the training program.

For children, the Hearing Loss Association of America believes that implanted children require, at least initially, a strong auditory-verbal training program. Without such a commitment, it is problematical whether implanted children can fully realize the potential benefit of a cochlear implant.

In short, HLAA believes that no child should be implanted without the assurance that such a program would be provided him or her.

Bilateral Hearing Advantage

Many implant users have some usable residual hearing in the non-implanted ear. The research suggests that, generally, the combined use of an implant and a hearing aid produces superior performance than with either modality alone. HLAA supports the use of a hearing aid in the non-implanted ear, with the understanding that individuals do differ in the potential value of this provision and that, at least initially, auditory training with the implant alone is a desirable practice.

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The general superiority of using hearing aids in the non-implanted ear i.e., bilateral hearing, also applies to the use of bilateral implants. It is a practice that HLAA supports, but again with the proviso that such decisions only be made only after consulting the relevant professionals (the surgeon, audiologist, etc.).

Implant Programming

Even more so than with hearing aids, it is necessary to program the implant to enable a person to achieve the most benefit from the device. Unlike hearing aids, it is not possible for an audiologist to listen to the output of a cochlear implant and then gain some insight into its performance.

The function of an implant must be inferred from a user's reactions and responses to the sound experience. Once the implant is activated (about a month post surgery), it is necessary to schedule a number of follow-up appointments during which the initial programming parameters can be set (the "MAP") and early modifications made. Each modification may, and often will, take individuals some time to become accustomed to the changed pattern of sound that it produces.

Once a satisfactory base MAP has been determined, HLAA recommends that a continuing and close relationship exist between the implanted individuals and the implant centers, with more frequent follow-ups in the period soon after the initial stimulation than at later periods. If any significant changes appear to be occurring in a person's speech or auditory performance, then the implant center should be contacted.

In order to achieve the maximum benefit from a cochlear implant, HLAA recommends that all adult implantees be considered candidates for some type of auditory training program. This program can be administered by the professionals in, or cooperating with, an implant center. Or it can be self-administered at home, under the general direction of the professionals. Either way, the intention is ensure that implanted people be helped to gain the most benefit from their new auditory capabilities.

As with children, one cannot simply provide adults the acoustic raw material via a cochlear implant without also helping them realize the greatest potential benefit from it. HLAA believes that some sort of auditory training program be included as a routine component of the cochlear implant process.

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Summary

In brief, it is the position of HLAA:

1. that cochlear implants are a positive development in aural rehabilitation for children and adults;
2. that adults have the authority to make their own decision regarding an implant, after consulting with the professionals at an implant center;
3. that parents of children with hearing loss have the responsibility and authority to make decisions for their children, but HLAA advises that such parents first be given the full range of educational and communication options available for their children; and
4. that all implantees, both children and adults receive an appropriate follow-up training program.

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