What is a Cochlear Implant, and who is a Candidate for Implantation?

In our last newsletter, we discussed how hearing aids work. However, implantable hearing systems are a consideration when conventional amplification is insufficient. For those with severe to profound inner ear hearing loss and sufficiently compromised speech discrimination ability, cochlear implants offer access to acoustic information via electrical stimulation of the hearing nerve.

A cochlear implant system is a prosthetic device that transduces acoustical into electrical sound and delivers this electrical stimulation to the hearing nerve directly. It is most often recommended for severe to profound hearing losses that are sensorineural in nature and when speech discrimination is poor for both ears. Cochlear implant candidates receive little or no benefit from traditional hearing aids. These implants are increasingly indicated for those with auditory neuropathy and can be recommended for some cases of congenital ear malformation where the hearing nerve has developed sufficiently.

Research on cochlear implants began in the 1960s, and the first implantation was completed at the House Ear Institute in 1961. Over the following decades various individuals and groups advanced cochlear research. Devices became commercially available in the mid-1980s. Today, there is a wealth of focused research devoted to device advancement and improving clinical outcomes.

How do cochlear implants work?

Cochlear implants are comprised of internal and external parts. An internal electrode is most often inserted into the cochlea via the round window or oval window. For cases of cochlear ossification or malformation, the electrode may be placed via a transmastoid approach. The electrode is connected to an internal magnet which is placed in a skin-covered trench surgically created in the mastoid bone. A magnetic connection frameworks the skin linking the external processor to the internal receiver; the external system is affixed to the head via the magnetic connection.

When electrical sound is transmitted, it flows from the external sound processor across the skin boundary to the internal receiver and then to the cochlear electrode array. The electrical energy is delivered at specific frequencies to the places where these frequencies are represented, even when there is extensive damage to the delicate sensory cells of the cochlea. 

Continued on page 5

Support Our "Run Because" National Partnership

The Foundation actively supports the Run Because running team at half-marathons in various locations around the United States. All funds raised by the team during these events are earmarked specifically for scientific research into Meniere’s disease through the American Hearing Research Foundation. Fundraising bare feet and walks will be taking place in the summer of 2015. If you are in the area, please show your support. Check their website for updated details at: http://runbecause5k1x50.wix.com/run-because.

Research Committee Member Wins Prestigious Fulbright Scholarship

Dr. Anna Lysakowski has received the Fulbright program to conduct longitudinal research on Meniere’s disease. She is now a Professor of Anatomy and Cell Biology and has been the faculty at UIUC since 1983. Dr. Lysakowski’s career highlights include an experiment on the different neural processes that allow a frog to sense different physical stimuli between surface and airborne waves. Her current research on Meniere’s disease focuses on the relationship with inner ear cell death and tinnitus. As a Fulbright Visiting Scholar, she is working with colleagues at the Digital Design Studio of the Glasgow School of Art on 3D reconstructions of biomedical images and her own EM tomography. The Foundation congratulates Dr. Lysakowski on this prestigious award.

Annual Giving Campaign

The Annual Giving Campaign supports the current research and educational programs that are vital to increased knowledge about hearing and balance disorders. The Foundation welcomes contributions of all levels and from individuals, organizations, and corporations. Gifts to the Annual Giving Campaign will be recognized in our publications and on our website. There are many ways to support the Foundation this year, and in years to come.

DONATIONS

Giving to the General Fund

Contributions to the AHRF’s Annual Giving Campaign support the Foundation’s general fund which underwrites research grants and special projects. General funds sustain the core programs that are central to the Foundation’s mission to support research into areas such as Meniere’s disease. Gifts are accepted on-line at the Foundation’s website and by mail or fax. There are several levels from which to choose:

Chairman’s Circle $5,000 and above
Research Champion $1,000 to $4,999
Supporter $100 to $999
Friends of the Foundation $99 and under

Honour and Memorial Gifts

We acknowledge gifts made in honor or in memory of the special people in our lives. We recognize these special tributes personally, and appreciate the kindness of many generous individuals. Please use the enclosed form to honor or remember a special person.

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The American Hearing Research Foundation is a designated charity for the Combined Federal Campaign under National/International Organizations, number 10571.

What do you do if you are shown a message in Amazon Smile?

If you enjoy shopping with on-line retailer Amazon, you can also provide financial benefits by choosing the American Hearing Research Foundation from their list of recognized charities. Tens of millions of products can be purchased through Amazon Smiles 45 available for this giving program. You can use an existing Amazon account and all of the account settings will be the same. The difference is that a portion of your purchase is donated to the American Hearing Research Foundation when it is chosen as your designated charity. Periodically, Amazon will offer limited time promotions that increase the donation amount. Certain restrictions apply. The donations made through this program are not tax deductible because the donation is being made by Amazon.

National Partnership

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Continued on page 5

Generally, there are two ways in which cochlear implants process and deliver sound: 1) stimuli are delivered to the cochlea and lower frequencies will be encoded at the apex. The higher frequency information will be more effectively delivered to more apical electrodes. 2) stimuli are delivered to the cochlea and lower frequencies will be encoded at the apex. The higher frequency information will be more effectively delivered to more apical electrodes. Because a cochlear implant is inserted at the basal end of the cochlea, it is likely that higher frequency information will be more effectively delivered. This can account for some of the high pitch or place/pitch relationship, 2) stimuli are delivered with a time/pitch relationship. The first processing strategy is governed by the place theory of the cochlea, which says that higher frequencies will be encoded at the base of the cochlea and lower frequencies will be encoded at the apex. Each successively deeper cochlear electrode corresponds to a lower pitch sound. Thus, higher pitch information is delivered to basal electrodes and lower pitch information is delivered to more apical electrodes. This is the method that is most often used, but it is likely that higher frequency information will be more effectively delivered. This can account for some of the high pitch or place/pitch relationship.
what factors affect implantation outcomes?

A number of different factors determine the success of a cochlear implant. Studies have shown that duration of deafness is a good predictor of success. Younger implant patients usually perform better than those who were implanted for the same length of time. Also, those who were prelingually deafened, who possess auditory memory, tend to be more successful than those who were predominantly deafened.

Anatomical and structural variables can affect the outcome of implantation. Those with a greater number of intact spiral ganglion cells typically have better outcomes. The depth of electrode insertion can be a predictor of success, as can the signal processing strategies employed in the device.

The second mechanism is designed to deliver stimulation in timed pulses which correspond to the frequency of sound. The temporal theory of sound processing says that acoustical pitch information is conveyed according to the temporal pulse rate and electrode activation. Changes in stimulation rate and site of stimulation are made in order to maximize speech intelligibility, but also based on patient perceived preferences.

To maximize the listening experience, healthcare professionals, family, and friends is critical to ensuring optimal device performance, to enhance learning, and to maximize speech intelligibility, but also based on patient perceived preferences.

Running the difference in 2015

to our many supporters, we are known as the premier nonprofit charitable organization dedicated to funding important research on hearing loss and balance disorders. to scientific researchers, we are known as the organization that welcomes innovation while providing rigorous scientific review of groundbreaking proposals. to patients, we are known as a compassionate and trusted source of information when trying to manage debilitating disorders. to so many people, we are the organization whose efforts will one day lead to better cures and treatments for people afflicted with hearing-related problems. but our work would not be possible without the generous and enduring support of the many individuals and organizations that share our goals.

as we approach our sixtieth year, the american hearing research foundation takes pride in its role as the leading non-profit organization dedicated to funding research on hearing loss and balance disorders. it is the foundation’s mission to improve the quality of life for those with hearing impairments by educating the public about these disorders. the foundation was founded in 1956 by chicago otolaryngologist dr. george e. shambaugh, jr. (1903-1999), and has been funding research into hearing loss and its causes and cures. the foundation funds eight to ten projects a year and has funded more than $1 million in research grants.

in 1940, a grant from the chicago community trust was used to construct and equip a laboratory at wescott memorial hospital, located in chicago, to perfect the fenestration technique, in the 1940s, grants from the john and mary r. mackie foundation of new york and gifts from grateful patients of dr. shambaugh and dr. eugene dartschle, the foundation’s co-founder, helped to construct and equip a hearing clinic at northeastern university medical school, the first of its kind where numerous diagnostic procedures were developed.

since then, numerous donors have made generous contributions to the foundation to provide critical funds for researchers investigating how we hear, why hearing is lost, and how it can be restored. research funds have provided new insight into hearing loss and have helped to illuminate promising pathways to hearing restoration in the future. won’t you please support the foundation as it engages with researchers through the grant programs, with patients and health care providers, and with all whose lives will be improved because of your donation.