Aural Rehabilitation of the Adult Cochlear Implant Recipient: A Discussion

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The advantages afforded by use of the cochlear implant in profoundly deafened adults have been well documented. The post-surgical rehabilitation program for the cochlear implant patient is an important variable in realizing these advantages. The purpose of this paper is to describe the communication skills of patients selected for an implant and the therapeutic techniques used in aural rehabilitation for these patients. Topics of voice monitoring, articulation, speechreading, telephone use and counseling are addressed, and a program of auditory training is outlined.

Adult patients enter our clinic's cochlear implant program with various degrees of communication proficiency. Generally, those who have experienced a steadily progressive hearing loss over many years are far better speechreaders than those who have suffered either a sudden complete loss of hearing or who have experienced a rapid deterioration of hearing acuity. Voice quality varies greatly from patient to patient and is characterized by inappropriate loudness, pitch, resonance, projection and prosody deficits. Patients complain of vocal fatigue, voice strain when talking for lengthy periods of time, and the fear of talking either too loudly or too softly for the given speaking situation. Articulatory skills have ranged from minimal deterioration of sound production to the typical distortions, substitutions, and omissions of articulation associated with "deaf" speech.

Our patients share emotional feelings of frustration, denial, rejection, withdrawal, isolation and projection similar to those described by Rousey (1971). They express an attitude of unwanted dependency on those around them, a concern for their physical safety, and reduction in ego-strength.

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Many have entered our program with a history of marital, family and peer difficulties, often initiated or exacerbated by the onset of deafness.

When post-lingually deafened adults enter our evaluation process, many present a history of no involvement in a comprehensive aural rehabilitation program other than unsuccessful hearing aid use. While some have been involved in a short-term attempt at improving their speechreading skills or training in manual communication, little emphasis has been placed on other aspects of rehabilitation. For some, an aural rehabilitation program or hearing aid has not heretofore been recommended, or, if the recommendation was made, it was not followed through by the patient. Therefore, individuals come to us with a wide variety of expectations for the cochlear implant, ranging from anticipating complete restoration of normal hearing acuity to restoration of only a minimal degree of auditory awareness.

Aural rehabilitation for cochlear implant patients begins at the time of initial patient contact and continues throughout the pre- and post-surgical period of adjustment in order to provide the beginning of a comprehensive program of rehabilitation designed to meet the specific needs of each patient and her/his family. This program is not unlike any other aural rehabilitation program for severely hearing-impaired people except for one difference. Because of the implant, we have "moved" these individuals an important step forward. Instead of relying solely on a unisensory or visual channel of receptive communication, these individuals now have the opportunity to utilize both auditory and visual channels. As several authors have reported (Whitehurst, 1964; Siegenthaler & Gruber, 1969; McCarthy & Alpiner, 1978), this one aspect can dramatically improve these individuals' communication function.

As discussed in other publications (Berliner & House, 1982; Porter, Lynn, & Maddox, 1979; Porter, Lynn, & Maddox, 1983), the cochlear implant patient enters a period of rehabilitation known as "basic guidance" approximately two months after surgery. During the basic guidance period, patients receive 25-30 hours of training by both audiologists and speech pathologists. Following the fitting and setting of the external processor, the rehabilitation program is divided into the following categories: (a) voice monitoring, (b) articulation (correction or conservation), (c) auditory training, (d) speechreading, and (e) telephone use.

VOICE MONITORING

The most quickly observed improvement in many post-lingually deafened and some congenitally deafened implant recipients' communication functioning is in their ability to make noticeable, positive improvements in voice quality and monitoring. Almost from the moment that the external processor is appropriately set, the implant recipient is able to alter vocal intensity to a more appropriate level, make subtle changes in pitch which more

closely approximate the fundamental frequency characteristics of their age group, and lessen the degree of vocal tension (Kirk & Edgerton, 1983). If the external coil is misaligned or the processor unit is turned off during the initial stages of tryout, the subject's vocal quality almost immediately reverts back to pre-implant status. However, it has been our observation that the longer subjects use the cochlear implant, the longer they are able to maintain appropriate pitch and intensity levels following shutdown of the external device.

During basic guidance, the patient is counseled as to the various parameters of voice which can now be better monitored through the newly acquired auditory feedback mechanism. The interrelationship of respiration and phonation is explained. Changes in pitch, inflection, intensity, and prosody are discussed with exercises presented to aid the individual in achieving better control of voicing through auditory, and to a lesser extent, through a kinesthetic-proprioceptive awareness. Additionally, exercises to reduce vocal tension and to improve projection and resonance are presented during the voice monitoring sessions. Of necessity, voice monitoring training for congenitally deafened subjects is often more involved that that required for post-lingually deafened subjects.

ARTICULATION — CORRECTION OR CONSERVATION

Oyer (1966) suggests that speech difficulties increase in direct proportion to an increase in the severity of the hearing loss. However, with the exception of one pre-lingually deafened adult with whom we have worked, the articulatory proficiency of our other patients with acquired losses has been surprisingly intact and functional, despite up to 30 years of profound deafness prior to the implant. That is not to say that our cochlear implant patients have not exhibited distortions, substitutions and omission of speech sounds. Rather, in our limited population, these distortions and omissions may only minimally affect the listener's perception of the deaf speakers' articulatory efficiency, while the distorted parameters of voice quality are more evident. Perhaps Subtelny and Walter's (1975) finding that an individual's speech is normally intelligible with a 25% or less error rate can be applied to our perception of the cochlear implant recipients' articulatory skills.

Speech conservation strategies are incorporated into basic guidance and may be discussed independently or in conjunction with a discussion of voice monitoring and/or speechreading proficiency. Speech correction, when necessary, falls outside the time frame of basic guidance with the recommendation for continued speech therapy being made on an individual basis.

AUDITORY TRAINING

To the patient, the first hours of cochlear implant use can be simultane-

ously exciting and deeply disappointing. The excitement stems from a new awareness of sound and the disappointment no doubt relates to the quality of sound. While a concerted effort is made to spend an appreciable length of pre-implant time counseling both the patient and family in the advantages and limitations of the implant, it is always the staff's concern that the initial moments of cochlear implant use will be disappointing to the patient. We hope that our patients have accepted the limitations of the implant by the time they are fitted with the external processor; however, we can only assume that at least *some* patients must emotionally experience a degree of disappointment when finding that the implant does not restore enough hearing for speech understanding through audition alone.

Initially, patients describe the sound they hear as "scratchy," "tinny," "crackling," or "metallic" (Theilemeir, Brimacombe, & Eisenberg, 1982). Often minimal pitch discrimination is noted. Patients initially have difficulty telling one voice from another, discriminating foreground from background sounds, or, in fact, being able to attach any appreciable meaning to what they hear.

For years many patients have been deprived of *all* auditory awareness, and the first few moments of auditory feedback with the implant are at best confusing. It is important that considerable time during basic guidance be devoted to creating an awareness and differentiation of sound for the development of critical listening skills. In our clinic, we utilize an auditory training program modeled around Carhart's (1961) four basic levels of training, namely: (a) development of sound awareness, (b) development of gross sound discrimination, (c) development of broad speech discrimination, and (d) development of fine speech discrimination. Each phase of auditory training is presented initially with both visual and auditory clues, and secondly with auditory clues alone.

Achieving an awareness of sound is almost an automatic process for those patients who are implanted in an ear that once perceived sound. On the other hand, implantation of a congenitally deaf ear sometimes results in a "non-ear perceived" sensation during the initial stages of cochlear implant use and has been described as "a feeling or pulsating vibration emanating from the forehead, chest or throat" (Eisenberg, 1982). As a rule, this phenomenon eventually rectifies itself following continued use of the implant.

The normal-hearing population is daily surrounded by a constant barrage of environmental sounds — many of which are relegated to the status of non-importance and are consequently ignored. To the profoundly deafened adult, however, the total deprivation of these environmental sounds often creates feelings of isolation and anxiety for their physical well being and safety. An important portion of basic guidance is devoted toward training the cochlear implant user to recognize and discriminate, when possible, common environmental sounds. From the onset of training, the patient is encouraged to keep a dated list of those sounds heard but not

recognized versus those sounds heard *and* recognized and to subjectively rank sounds heard as either "pleasant" or "unpleasant." The rationale for this list keeping is twofold: (a) the cochlear implant user will develop an active rather than passive listening role, and (b) with continuous use of the cochlear implant device over time, some sounds initially heard but not recognized will become recognizable, and some sounds earlier categorized as unpleasant will become less bothersome.

Training in gross sound discrimination is directed toward requiring the cochlear implant user to become an active participant in categorizing certain sounds as to their environmental, acoustical and prosodic features. Patients are encouraged to search out various sounds in their environment and to determine whether or not and to what degree these sounds exhibit distinctive acoustical differences. Recorded environmental sounds are introduced into basic guidance first in closed set paradigms and then in more open-ended but still somewhat restricted sets; e.g., sounds that would most commonly be heard in the kitchen. When time permits, a walk around the clinic grounds, a brief ride in the car, or other field trip experiences are incorporated into the therapeutic setting for recognition and discrimination of sounds.

From the onset of the patients' initiation into the cochlear implant program, they are told repeatedly that the cochlear implant will *not* provide the quality of sound necessary to understand speech without the aid of speechreading. However, we do know that, with training, the cochlear implant user is able to distinguish certain acoustical differences of speech through audition alone. Training in broad speech discrimination is directed toward making those distinctions. Initially the patient is presented with a list of three or four sentences differing considerably in length, prosody and voicing. These sentences are presented both visually and auditorily, and the patient is asked to identify the target sentence through audition alone. If an error is made, the correct sentence is identified and repeated. Presentations of each stimulus sentence are made in random order so that a "percent correct" score can be established. Sentences are then added to the list for continued discrimination so that eventually the patient may have a list of 10-15 sentences from which to choose. Following this, sentences more closely resembling one another in length, prosody and voicing are introduced. Discrimination of easily recognizable songs may also be incorporated into the training session for discrimination through audition alone.

A list of monosyllables, trochees and spondee words for auditory discrimination are presented in fine speech discrimination training. Presentations are randomly given for each word with percent correct recorded. Our patients have less difficulty differentiating monosyllables from trochees and spondees than they do differentiating trochees from spondees but, with continued practice, many of our patients become fairly adept at eventually differentiating the three groupings of words.

Following this, the client is presented with two monosyllabic CVC words differing by only one distinctive feature. Contrast of final consonant sounds is presented first and is usually more easily perceived than is discrimination of medial vowel or initial consonant sounds. Finally, auditory discrimination of individual phonemes is presented.

SPEECHREADING

Speechreading therapy, relying solely on visual input, is not included in our clinic's rehabilitation program. Instead, emphasis is placed upon the integration of auditory and visual clues as an aid to improving speechreading proficiency. All speechreading therapy is conducted with the external processor on, and all materials are presented at normal conversational intensities. Both an analytical and synthetic approach to speechreading are offered. All patients are counseled relative to variables affecting speechreading proficiency such as: (a) lighting conditions, (b) visual distractions, (c) familiarity of the speaker, (d) individual differences in articulatory movements, (e) familiarity with subject matter, (f) gestural movements, and (g) facial clues.

Family members are also counseled regarding their responsibility in facilitating speechreading for the implant recipient. The patient may be observed in communication situations with her/his family, and the patient and family are offered suggestions in ways of achieving more effective communication. Role playing and other contrived situations may also be incorporated into this phase of training.

Edgerton, Prietto, and Danhauer (1983) have reported that implant recipients with good "visual only" speechreading skills prior to the implant demonstrate slightly less speechreading benefit from the cochlear implant than do those patients who were poor "visual only" speechreaders pre-implant. However, nearly all of our patients who were "good" speechreaders prior to implantation have reported a general improvement in speechreading with a lessening of fatigue and tension and a lengthening of concentration during communication activities.

TELEPHONE USE

With the use of the cochlear implant device, the vast majority of our patients are able to hear the dial tone, to discriminate between the ringing and busy mode, to recognize that the phone has been answered, and to hear the phone at close range when it rings. We instruct them in the use of a simple telephone code which can not be used for conversation but for information gathering telephone use. The code is structured on a question/answer format with a "no," "yes-yes" or "please repeat" response elicited from the normal hearing participant. The major difficulty our patients encounter in using the code is in learning how to structure their questions to

receive informative responses. Role playing of possible telephone situations is presented to assist them in question formulation.

CONCLUSION

A number of communication strategies and therapeutic techniques employed in cochlear implant rehabilitation have been discussed. These techniques are introduced during basic guidance and are elaborated upon when rehabilitation extends beyond the basic guidance period. In addition to rehabilitation training, considerable time may be spent in counseling of the patient and family. Many patients and family members have never been afforded the opportunity to discuss openly and at length the psychological impact that deafness has placed upon their lives or to discuss the magnitude of communication difficulties they are experiencing. It is important that patients and their families be allowed time to discuss their deafness and to identify and confront sources of anger, frustration, denial, etc. with an objective listener and reactor. It is our feeling that a combination of therapeutic techniques and counseling best facilitates the cochlear implant patient and family members in making positive and productive changes in quality of life following cochlear implant surgery.

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