SPEECH PERCEPTION OF HEARING AID USERS VERSUS COCHLEAR IMPLANTEES

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Recent improvements in speech recognition for profoundly deaf cochlear implant patients have suggested that some people with a severe hearing impairment would be more successful with a cochlear implant than a hearing aid. Unfortunately, no studies have investigated the speech perception of the severely hearing impaired in order to compare their speech perception abilities with those of cochlear implant users. To investigate this area further, a detailed investigation of the hearing aid performance of people with a severe hearing loss is being conducted in the Department of Otolaryngology at The University of Melbourne. The range of hearing losses for this study was defined as a pure tone average of greater than 60dBHL, but no worse than 100dBHL in the better ear. All thirty-five (n=35) participants have been involved in this study. Each participant took part in a series of speech perception tests which included 24 consonant recognition, 11 vowel recognition, CNR words, CUNY sentences, and the connected speech test. Significant correlations (p<0.01) were found between pure tone thresholds and speech recognition tests. A large proportion of the variance in the scores was not accounted for by this factor. Other factors, such as the configuration of the hearing loss, type of pathology, use of contextual cues, and age were discussed. Comparisons of mean scores were made between the group of severely hearing impaired people and a comparable group of multiple channel cochlear implant users. It was found that the severely impaired group performed better (p<0.0001) than the group of cochlear implant users in the consonant, vowel and word recognition tasks. Conversely, in assessments of sentence recognition the cochlear implant group performed better (p<0.05) than the group with severe hearing impairment.

COCHLEAR IMPLANTS, HEARING AIDS, OR BOTH TOGETHER?

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The question posed in the title is one that otologists and audiologists will need to answer more frequently for individual clients because cochlear implant performance ranges now overlap considerably with those of hearing aids in the severely-profoundly hearing impaired population. Statistical analyses of monaural speech perception scores using cochlear implants and hearing aids indicate that different factors are important in the two cases. For example, audiological thresholds are highly correlated with hearing aid performance in listeners with severe hearing impairment. In contrast, pre-operative audiological thresholds and post-operative thresholds for electrical stimulation have little predictive value for speech perception in implanted ears for postlinguistically deafened adults. The situation is different for children where use of a hearing aid with aided thresholds that allow detection of speech frequencies above 1500 Hz pre-operatively is a positive influence on subsequent cochlear implant performance. Thus the optimum choice of device(s) may be different for different individuals.

Data demonstrating the effect of (pre-operative) hearing thresholds on cochlear implant performance will be reviewed and compared with hearing aid performance to substantiate the statements above. In addition, binaural results for implant patients who use a hearing aid in the non-implanted ear will be presented and the effect of the level of residual hearing in the nonimplanted ear on the size of the binaural advantage will be discussed. Experimental studies in several groups of patients indicate that the hearing sensations from electrical and acoustic signals can be combined to provide binaural speech perception scores that are significantly higher than for the better monaural condition. The binaural advantage is greater in background noise than it is in quiet, even when the speech and noise are presented from the same direction. For example, a study of five listeners with a range of pure tone average hearing losses from 75 to 112 dB HL found mean differences between binaural and implant only scores of 7% in quiet and 23% in noise (average of 5 and 10 dB signal to noise ratio) for an open-set CUNY Sentence Test.

Clinical decisions about optimum device fitting need to account other factors such as cost, convenience, comfort and client preferences. Some binaural device users prefer to hear sound in both ears rather than on one side only, and some report that the hearing aid contributes to the "naturalness" of the overall percept. If binaural fitting is chosen, there are advantages in adjusting and managing the two devices together, rather than having separate services for each ear. For example, adjustment of loudness to provide a balance between the two ears and a comfortable binaural level has overcome some potential problems experienced by patients participating in a "Combionic Aid" trial in Melbourne and Denver.

In conclusion, the choice of devices and management of implant and hearing aid together are complex issues influenced by many factors, but there is a potentially significant gain in speech perception for suitable clients who are appropriately fitted.

THE CURLY ELECTRODE FOR COCHLEAR IMPLANTS: FIRST EXPERIMENTAL AND CLINICAL EXPERIENCES.

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Introduction:
An electrode position closer to the modiolus and the ganglion cells will lower the current threshold values for electrical stimulation and decrease the power consumption. Channel separation might be improved.

Technical concept:
A new curly electrode was developed using the standard nucleus 22 channel electrode and a teflon back-strip which was fixed at the tip of the electrode array. After normal insertion into the scala tympani the electrode can be moved from the lateral to the modiolus position with additional advancement towards the end of the second turn.

Temporal bone insertion studies:
The insertion can be done at a standardized version. The further advancement is smooth and easy. The X-ray control shows modiolus position of the electrode with the tip at the end of the second turn. Explanation and reimplantation is also possible. No severe damage was seen in this cadaver studies.

Animal experiments:
The same insertion was done in cats with acute and chronic recording of impedances, thresholds for E-ABR and optical recording. The thresholds were lower for the modiolus position compared to the lateral wall position. Long-term stability of impedances and thresholds could be demonstrated. The histological examination was done with both light microscopy and SEM.

Implantations in humans:
The implantation was uneventful. The intraoperatively recorded thresholds for both E-ABR and the stapedius reflex were lower for the modiolus position (average reduction of 3 dB). Reimplantation was also possible without any difficulty. The inserted electrode cannot be
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