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Speech Perception Performance of Congenitally Deaf Patients with a Cochlear Implant: The Effect of Age at Implantation

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The relation between age at cochlear implantation and long-term open-set speech recognition was studied in a group of nine congenitally deaf children. The age at cochlear implant surgery ranged from 4 to 13 years. The results showed that there was a tendency toward poorer results in the children im-

planted at a relatively older age. However, the results also indicated that an upper limit for age at implantation cannot yet be defined in these children. **Key Words:** Benefit—Cochlear implantation—Children.

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Speech perception testing is used widely for evaluation purposes after cochlear implantation, even in young children. Especially in congenitally deaf children, it may take some time before any progress is made in speech perception (1,2). Significant differences in speech perception performance have been found in such children; some learn to perform well on open-set speech recognition, whereas others have persistent difficulty with speech identification tasks. A factor that may play a role is age at cochlear implantation. It has often been argued that the younger the child, the greater the chance of success (3). However, not all deaf children are referred to a cochlear implant (CI) center at a young age.

This paper presents the long-term speech perception results of a group of congenitally deaf children with a CI. The results are discussed in relation with age at implantation.

SUBJECTS AND METHODS

The experimental group comprised nine children with a CI. Eight of them were born deaf, and the other child became deaf after contracting meningitis at 3 months of age. They were all profoundly deaf with hearing thresholds of more than 110 to 120 dB HL. The children had been using a Nucleus multichannel CI (Cochlear Inc. Sydney, Australia) with a mini-speech

processor (MSP) on a daily basis for at least 18 months (mean 33 months). The age of the children at surgery ranged from 4 to 13 years.

Speech perception tests were administered at 3, 6, 12, 24, and 36 months after the CI speech processor had been fitted. In the present analysis, only the phoneme score of the open-set word recognition test was used (20 items, 60 phonemes). More specifically, using interpolation, the moment (in months after device fitting) was determined at which the phoneme score exceeded 25%. This moment was called the OS₂₅. The value of 25% was chosen because all the children had reached the score within 36 months.

RESULTS AND DISCUSSION

Figure 1 shows the OS₂₅ value for each child as a function of age at cochlear implantation. Obvious differences are seen between the children. There seems to be a tendency toward poorer results in the children implanted at a relatively older age. This tendency is in agreement with the results of a previous study that revealed poor performance of congenitally deaf patients implanted in adulthood(4). Their open-set speech recognition was particularly poor.

For reference purposes, OS₂₅ values also were determined in postlingually deaf children with a CI (age at the onset of deafness was 3 years or older). Their mean OS₂₅ value was 5 months, with a range from 2 to 7 months. Surprisingly, two of the congenitally deaf children had an OS₂₅ value that was close to this mean value; in five of the other seven children there was a "delay" of 6 to 9 months. On theoretical grounds, con-

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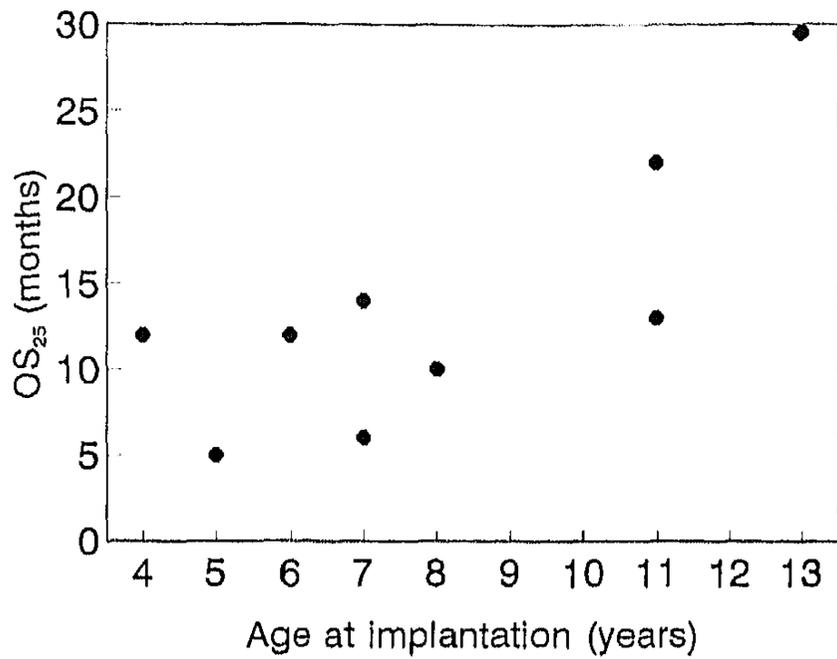


FIG. 1. Speech perception performance of the nine children expressed as the OS₂₅ (time in months until the open-set speech recognition score exceeded 25%) as a function of age at cochlear implantation.

genitally deaf children can be expected to be slower than postlingually deaf children and such a “delay” has also been mentioned by others (1,2). Statistical analysis showed that age at implantation did not have an effect

on OS₂₅ after the child implanted at 13 years of age had been excluded.

It has been argued that cochlear implantation may not be effective at a relatively late age in congenitally deaf children. However, cochlear implantation can be successful, even after 10 years of age, as it is illustrated by the results of one of the children implanted at 11 years of age. His open speech recognition score at a 24-month follow-up was 38% (average value of the postlingually deaf children: 81%, range 73-88%).

As noted, all nine children demonstrated open-set speech recognition. The age at cochlear implantation did not seem to play a decisive role, especially below an implantation age of 10 years.

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