REFERENCES


COMMENTARY

This is an encouraging case report for the hearing handicapped and for those working with them.

Joan refused to use binaural aids in spite of rather remarkable improvement in speech perception ability in her right ear and it was not before loss of function in the monaurally aided ear that she positively accepted the right ear amplification. In our long-term study we also have experienced many cases in which the patients would not accept binaural amplification when they had already distinct “dominance” in the monaurally aided ear, and we have as yet not confirmed whether the speech discrimination in the “recessive” ear can be improved, if possible, to what extent, and by what strategy. The “recovery” of the right ear speech perception ability in this case could be explained as follows.

1. As is described in the Comments of Boothroyd’s report, Joan’s hearing loss was slight to moderate until 3 to 4 years of age. During this period, her auditory path from the right ear to auditory cortex and speech center to the processing mechanism of speech sound developed somehow and she showed nearly as good speech perception scores in her right ear until 7.5 years old, despite her hearing deteriorating at 5 years of age, and monaural amplification in the left ear was continued.

2. The development of the central nervous system depends on both the genetic program and stimuli from the environment. Because the human brain is immature when a baby is born, the postnatal development of the neuron networks are largely influenced by the latter, and the plasticity of synapse development by sprouting is greatest before 1 to 2 years of age, declining rather rapidly thereafter, but not abolished completely in adulthood. This morphologic synapse network is a necessary condition for the acquisition of complex neural function. Myelination, which is one measure of maturation of the developing nervous system, begins already in intrauterine life from the lower auditory path and is completed in acoustic radiation by about 3 to 4 years after birth. Therefore, it is assumed that in her right auditory pathway, such synapse networks were developed morphologically, which has potential to process acoustic stimuli when needed.

3. Motivation is indispensable for the success of rehabilitation. It was the most powerful factor in this case. Of course, her intelligence, character, education, familial and social environment, and other factors must have had a positive effect on her success.

As to the notion that the earlier poor performance of the unaided ear was due, not to an irreversible loss of peripheral function but to a lack of experience in interpreting the patterns of neural stimulation generated by that ear, I want to make some comments.

The processing of speech sounds is performed by the interaction between the central and the peripheral auditory system. It is a well-documented fact that centrifugal pathways including efferent olivocochlear bundle from cortex to hair cells in cochlea have some control.
over the periphery, for example, facilitating and inhibitory effect on afferent impulse, control of filter bandwidth (critical band), which facilitates hearing in noise, frequency resolution in the cochlea, and ascending auditory pathway. That is, the auditory center with its associated field and auditory periphery act as one unit in the processing of speech sounds. Therefore, "recovery" in this case should not be interpreted solely as the results of learning in the auditory cortex. Because her auditory cortex had been largely adapted to substantially distorted information from her aided ear for almost 20 years, when the amplification in her right ear was started at 24 years of age, the period needed for recovery and the grade of recovery must be assumed to depend largely on the functional recovery in the neuron-network in the auditory pathway under control of auditory cortex with associated fields.

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REFERENCE