Confirmation of G. von Békésy's Theory of Paradoxical Wave Propagation along the Cochlear Partition by Means of Bone-Conducted Auditory Brainstem Responses

Abstract:
In order to investigate the propagation time of the traveling wave in the cochlea after boneconduction stimulation of the inner ear, bone-conducted auditory brainstem responses (ABRs) were recorded in 6 normally hearing subjects after masking the basal cochlear region using high-pass filtered noise. As in air-conducted ABRs, Jewett V wave latency is delayed corresponding to the propagation time of the traveling wave front traversing the desynchronized hair cell region. These results support the theory of paradoxical wave propagation proposed by von Békésy in 1952, who postulated that wave motion always starts from the stiffest part of the basilar membrane, independent of the location of the vibrating force. In addition, we also found a latency delay of the Jewett V wave of bone-conducted ABRs in 8 patients with high-frequency hearing loss which corresponded to the severity of their hearing impairment.

Stichworte:
Auditory brainstem responses; Boneconduction; Traveling wave; Paradoxical wave propagation; High-pass noise masking

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