Uncovering Hidden Hearing Loss

By Fan-Gang Zeng, PhD

If you attended any scientific or clinical meetings in 2014, you probably heard the phrase "hidden hearing loss" more than once. What exactly do these buzzwords mean, and how will they affect your practice?

Let's start with the familiar term of hearing loss, which traditionally has been defined by the audiogram. A person is considered to have hearing loss if he or she has a pure-tone threshold above 20 dB HL at one or more octave frequencies, typically from 125 Hz to 8,000 Hz.

Simply speaking, hidden hearing loss means a form of hearing loss that cannot be measured by the audiogram. What types of hearing loss go beyond the audiogram?

Auditory neuropathy and central auditory processing disorders are likely coming to your mind. Indeed, at least some patients with either disorder can have a normal audiogram but impaired suprathreshold functions, especially those related to temporal processing and speech recognition.

Recently, researchers discovered a new form of hidden hearing loss related to aging and noise exposure in animal models, as Sharon G. Kujawa, PhD, of Massachusetts Eye and Ear Infirmary, wrote in the November issue of *The Hearing Journal* (see **bit.ly/HJ-Kujawa**).

In these models, animals exposed to even a moderate level of noise have normal cochlear outer hair cells but damaged auditory neurons. Functionally, the animals can have a normal audiogram but significantly reduced input to the brain.

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At present, the direct link of this new hidden hearing loss to human ears is still missing. The perceptual consequences of this phenomenon remain unclear, although experts have suggested a strong relationship to difficulty understanding speech in noise, and to tinnitus and hyperacusis.

NEW DIRECTIONS

How do we properly diagnose this new form of hidden hearing loss? If the same mechanism discovered in animal models holds in human ears, then we need to look closely at wave I in the auditory brainstem response (ABR).

When all other tests are normal, including the audiogram, otoacoustic emissions, and even wave V of the ABR, a missing or diminished wave I would suggest a reduced number of auditory nerve fibers in the human ear.

Reliable and accurate ABR recording also will help differentiate the condition from other forms of hidden hearing loss, such as auditory neuropathy, which usually affects both waves I and V.

What about proper management of this new form of hidden hearing loss? It is still challenging, as we, from researchers to engineers to clinicians, have not done a very good job in addressing the related symptoms.

First, most hearing aid users still rank difficulty understanding speech in background noise as their number one complaint. Second, people with tinnitus or hyperacusis receive limited benefits from current management options.

Recognizing the importance of understanding neural degeneration, the Hearing Industry Research Consortium has issued a request for proposals to study this new form of hidden hearing loss. That's music to our ears because this research direction will not only improve the understanding of human hearing disorders, but also expand hearing aid applicability to new indications.

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