In Response to Determinants of Bilateral Audiometric Notches in Noise-Induced Hearing Loss

In Reply:

It is a pleasure to respond to the letter to the editor by Dr. Robert A. Dobie. There is no doubt that many factors contribute to hearing impairment and result in the variability of hearing thresholds. The complexity makes the research about noise-induced hearing loss (NIHL) in the human complicated. Conducting a strictly controlled study, with study subjects purposely exposed to noise of variable intensity or even hazardous levels, is ethically not allowed. The effect of age on hearing thresholds, the most important factor of hearing impairment, is not well understood and cannot be precisely predicted. From the ISO-1999 model, we know the variation of hearing thresholds in a highly screened subject with known age, sex, and noise exposure levels or duration.1 Comparing the presented hearing thresholds with the ISO-1999 model is a better way to explore other possible factors such as those associated with NIHL.

Although variance possibly exists in hearing thresholds when a subject undergoes several examinations at different times, the effect of this factor on the analysis might be less or could be neglected, because all of our subjects were well-instructed and cooperative adults who regularly received pure-tone audiometry (yearly after exposure to occupational noise) by an audiologist using standard methods, in soundproof booths, after their work shift. In our study, subjects with notches did not have a statistically significant difference in hearing thresholds of 2 kHz or 8 kHz as compared with those without notches (either with or without a hearing-protection device). However, subjects with notches did show a significantly better hearing threshold of 1 kHz than those without notches. It did not overturn the presence of the audiometric notch defined by Coles et al., and therefore we believe the notches were not spurious.2

There are many causes that can result in variant patterns or severities of hearing loss. However, it is clear in our study that the presence of the bilateral audiometric notches would be suggestive of the vulnerability to factors related to hearing deterioration and the propensity to have hearing impairment, including so-called NIHL, but this has poor correlation with age, noise exposure duration, or noise level. We agree that other factors, such as genetic susceptibility and nonoccupational noise exposure, would also play a role in developing an audiometric notch.

In the article, we stated that “bilateral audiometric notches are pathognomonic for NIHL with chronic noise exposure.” Pathognomonic is a medical term of Greek origin, derived from pathos (meaning “disease”) and gnomon (meaning “judge”). In other words, physicians are usually able to achieve a specific diagnosis in the presence of a pathognomonic sign or symptom. In terms of epidemiology, this is because of the high positive predicative value (PPV) of the pathognomonic sign or symptom, and it is well known that PPV is substantially influenced by the prevalence of the disease in the population. Although audiometric notches have been associated with closed head injury, barotrauma and labyrinthitis, in a cohort with chronic noise exposure the prevalence of NIHL by far exceeds those of closed head injury, barotrauma and labyrinthitis. We would agree that an audiometric notch is suggestive of NIHL in general population. However, it is reasonable for the physician to make a diagnosis of NIHL in the presence of bilateral audiometric notches for those with chronic noise exposure.

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