What Defines Asymmetric Sensorineural Hearing Loss?

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BACKGROUND

Defining significant asymmetric sensorineural hearing loss (ASNHL) is important to determine if a patient requires further evaluation for retrocochlear pathology. Currently, gadolinium-enhanced magnetic resonance imaging (MRI) is the gold standard to identify pathology in the internal auditory canal (IAC) and cerebellopontine angle (CPA) responsible for ASNHL. The most common lesion in the IAC and CPA is a vestibular schwannoma with the sensitivity and specificity of MRI approaching 100% for these tumors. ASNHL is the most common presenting symptom associated with a vestibular schwannoma, but the degree of asymmetry varies greatly, and some patients may even have symmetric hearing. Thus, defining what degree of ASNHL places a patient at higher risk for vestibular schwannoma detection continues to be debated in the literature without consensus.

A broad definition of ASNHL will increase sensitivity and identify a greater number of tumors, but it will also generate a greater number of negative studies, increased healthcare costs, and greater patient anxiety. A narrow definition of ASNHL increases specificity but risks missing a diagnosis and a potential therapeutic window for hearing-preservation surgery, stereotactic radiation, or improved facial nerve outcomes. Thus, the definition of clinically significant ASNHL requires optimization of both sensitivity and specificity to maximize its benefit as a screening tool for retrocochlear pathology.

LITERATURE REVIEW

A search of the literature generates numerous definitions of ASNHL. Some of the more prevalent definitions are summarized in Table I and include variations in the audiometric frequencies of interest, magnitude of hearing loss, and speech recognition. Saliba et al. reviewed frequency asymmetry of 74 patients with vestibular schwannoma and 48 patients without vestibular schwannoma, and found that when comparing asymmetry across all frequencies, an interaural difference of 15 dB HL or more at 3,000 Hz was most significant. When they defined the cutoff for a positive test at 50% probability, their receiver operating characteristic curve revealed a sensitivity of 73% and specificity of 76%.

Gimsing compared eight screening protocols from 199 vestibular schwannoma patients and 225 nontumor patients. These protocols were evaluated for sensitivity and screening rate, or percent of patients tested who would require further evaluation with a MRI. Although there were screening protocols that provided greater than 95% sensitivity, they also required screening greater than 34% of the test subjects. An interaural asymmetry of ≥20 dB HL at two contiguous frequencies, or ≥15 dB HL at any two frequencies between 2,000 Hz and 8,000 Hz provided a balance of high sensitivity (91%) and low screening rate (23%).

In a study using 312 patients with ASNHL defined as ≥15 dB HL difference at two or more frequencies or ≥15% difference in speech recognition, Cueva found that 31 (9.9%) patients had lesions identified via MRI that were responsible for the ASNHL. This disease prevalence is much higher than the annual reported incidence in the general population of one to two cases per 100,000 individuals. It is important, however, to note that this study used an absolute cutoff of 15% for speech recognition asymmetry, yet there is a long-established binomial model for significant asymmetry first described by Thornton and Raffin in 1978 and modified by Carney and Schlauch in 2007. This model outlines the upper and lower limits of normal word scoring variability based on a patient’s score and the number of words tested. Thus, a single absolute difference (i.e., 15%) in word recognition misses the nuances of normal variation patterns that occur in word-recognition testing.

One limitation of any definition of ASNHL is generalizability to a larger population. For example, in a study of active duty military personnel who have a significantly higher prevalence of noise-induced ASNHL, the diagnostic yield of MRI was <1% when defining ASNHL as an interaural difference of ≥15 dB HL at only 3,000 Hz. This

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is significantly lower than other studies, prompting the authors to modify their definition of ASNHL for those with noise exposure to an interaural difference of ≥10 dB at 2,000 Hz. This study demonstrates that defining ASNHL must be taken in the context of a patient’s clinical history and disease prevalence of the local population.

**BEST PRACTICE**

Asymmetric SNHL is a frequent audiometric finding, and deciding which definition of asymmetry is the most clinically meaningful requires careful consideration including a risk–benefit assessment of the testing burden for each individual patient. No single definition of ASNHL is 100% sensitive for identifying retrocochlear pathology. The literature supports the use of threshold screening for asymmetry defined as an interaural asymmetry of ≥20 dB HL at two contiguous frequencies or ≥15 dB HL at any two frequencies between 2,000 Hz and 8,000 Hz. There is less evidence to support the use of a single absolute difference in speech recognition alone for identifying what defines a significant interaural asymmetry. Rather than a single absolute difference, physicians should familiarize themselves with the variability of speech recognition scores according to the binomial distribution table outlined by Carney and Schlauch.

**LEVEL OF EVIDENCE**

One study had level 2 evidence (prospective study), whereas three other studies had level 3 evidence (retrospective reviews).

**BIBLIOGRAPHY**