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Phonetics and Audiology

Commentary

Pathophysiology and Diagnosis of Presbycusis

Sergio Gonzalez*

Department of Phonetics, Scuola Normale Superiore di Pisa, Piazza dei Cavalieri 7, Pisa, Italy

DESCRIPTION

The cumulative impact of ageing on hearing is known as presbycusis (sometimes spelt presbyacusis; from the Greek presbys "old" Plus o akousis "hearing, meaning age-related hearing loss). It is a bilateral, symmetrical, age-related sensorineural hearing loss that is gradual and irreversible and caused by cochlea degeneration or other associated inner ear structures or auditory nerve degeneration. The loss of hearing is particularly noticeable at higher frequencies. Although it might be challenging to distinguish between the particular effects of various sources of hearing loss, presbycusis is not hearing loss that worsens with age but is brought on by causes other than normal ageing.

Presbycusis is brought on by heredity, repeated environmental exposures, and pathophysiological alterations brought on by age. There are no known preventive precautions at this time; the only available treatments are hearing aids and surgical implants.

The most prevalent cause of hearing loss, presbycusis affects one in three people by the ages of 65 and 75, respectively. Next to arthritis, presbycusis is the condition that affects older individual's more frequently.

Many vertebrates, including fish, birds, and amphibians, do not develop presbycusis as they can regenerate their auditory sensory cells. However, mammals, including humans, lack this ability due to genetics.

Pathophysiology

Cochlea hair cell degeneration and large stereociliary degeneration are two examples of the microscopic abnormalities that can be detected in this syndrome.

Presbycusis can manifest as one of four pathogenic phenotypes:

- **Sensory:** characterized by the organ of Corti's (the sensory organ for hearing) deterioration. It is made up of hair cells with stereocilia that reach the tectorial membrane and is situated within the scala media.
- The outer hair cells of the organ play a vital role in sound amplification and are very sensitive to both internal and external variables.
- The outer hair cells do not regrow if they are injured.
- As a result, the part of the tonotopic spectrum that the injured cells are responsible for experiences a change in perceived loudness as well as a loss of hearing sensitivity.
- **Neural:** marked by the spiral ganglion cells' degeneration.
- **Strial/metabolic:** marked by stria vascularis atrophy in all cochlear turns.
- The sodium-potassium-ATPase pumps in the stria vascularis, which are found in the lateral wall of the cochlea, are in charge of creating the endolymph resting potential.
- The endolymphatic potential becomes more difficult to maintain as people age, which results in a drop in cochlear potential.
- **Cochlear conductive:** caused by the basilar membrane's mobility being hampered by stiffening. It has not been established that this kind of disease causes presbycusis.

There are also two further types:

- Mixed
- Indeterminate

The audiogram's form distinguishes between flat loss and sudden high-frequency loss (sensory phenotype) (strial phenotype). Only about 5% of instances with SNHL are sensory, with strial being its mainstay. Speech comprehension is unaffected by the low-frequency hearing loss that characterises this form of presbycusis. In neural presbycusis, audiograms often display a mild downward slope into higher frequencies with a progressive deterioration over time. The difficulty of amplification owing to poor understanding is sometimes attributed to a substantial loss in speech discrimination that is out of proportion to the threshold loss. Clinical testing demonstrates a gradual, symmetrical, and bilateral progression of hearing loss. The audiogram associated

Correspondence to: Sergio Gonzalez. Department of Phonetics, Scuola Normale Superiore di Pisa, Piazza dei Cavalieri 7, Pisa, Italy, E-mail: Sergio.gonzalez@iulm.it

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with sensory presbycusis is thought to exhibit a strongly sloped high-frequency loss extending beyond the speech frequency range.

Diagnosis

There are four levels of hearing loss: mild, moderate, severe, and profound. The degree of hearing loss in each ear is typically classified using pure-tone audiometry for air conduction thresholds at 250, 500, 1000, 2000, 4000, 6000, and 8000 HzAlthough it has been suggested that 15 dB (about half as loud) is more average, normal hearing thresholds are currently thought to be 25 dB sensitivity. The thresholds for mild hearing loss are between 25 and 45 decibels (dB), moderate hearing loss is between 45 and 65 dB, severe hearing loss is between 65 and 85 dB, and profound hearing loss thresholds are beyond 85 dB.

When tinnitus just affects one ear, the doctor should start further investigation to rule out other potential causes. Additionally, additional imaging may be necessary if there is a pulse-synchronous rushing sound to rule out vascular diseases.