

Hearing Loss

Courtesy of U. M. Bloedel Hearing Research Center, University of Washington

Over 25 million Americans have some degree of hearing loss and, as the average age of the population increases, this number will rise. Hearing loss is characterized by type of loss (conductive, sensory, neural) location of the problem (middle ear, cochlea, auditory nerve, central) degree of loss the condition that causes it.

CONDUCTIVE HEARING LOSS

Conductive hearing loss results from external or middle ear problems, which are often mechanical in nature and often can be corrected by medicine and/or surgery. There are various causes for conductive hearing loss, including otitis media and otosclerosis.

Otitis Media: The most common cause

of conductive hearing loss in children is otitis media infection in the middle ear cavity. The infection may start in the nose from a cold and spread to the middle ear via the eustachian tube. If the infection progresses, fluid forms in the middle ear impeding transmission of sound and can result in a mild, conductive hearing loss as long as the fluid persists. Chronic otitis media is a major cause of hearing loss in medically under-served areas worldwide.

Surgical treatment is usually necessary if the infection persists and, thanks to modern techniques, is highly successful. A perforated ear drum caused by otitis media or by physical tearing can be repaired in 95% of cases, restoring hearing to normal levels. Our knowledge of otitis

media has dramatically increased over the past two decades and its treatment has had an important impact on children's health care. Antibiotic treatment, tympanostomy tubes and adenoidectomy have been mainstays in treatment but development of vaccines against the most common bacteria is in progress. When perfected they should provide a major improvement in pediatric health care.

Otosclerosis:

The most common cause of conductive hearing loss in adults is otosclerosis. About 10% of the entire population has otosclerosis but only 10% of those have hearing loss as a result. The loss results from

fixation of the stapes (the third bone in the middle ear) so that sounds cannot be transported to the inner ear. Otosclerosis is thought to be an inherited condition. It usually begins in early adulthood and progresses slowly, typically causing up to a 60 dB loss in both ears. Surgical treatment is very effective, with over 90% of patients achieving normal hearing levels. Occasionally the otosclerotic bone will invade the cochlea to produce a sensory loss as well. Fortunately this is rare. Removal of the stapes (stapedectomy), which has been done for 40 years or the newer laser technique of partial removal (stapedotomy) followed by reconstruction with a small piston-like device result in better hearing with little risk to the inner ear or balance disturbance. This means patients return to work sooner after surgery and can expect significantly better hearing.

SENSORY HEARING LOSS

Sensory hearing losses are due to disorders in the inner ear, specifically, the cochlea. This type of loss may be present at birth (congenital hearing loss) resulting from abnormal cochlea development or inherited conditions, or the loss may be the result of an acquired condition, such as meningitis, an infection of the fluid around the brain often extending into the inner ear. Another example of a sensory hearing loss condition is Meniere's disease.

Many hereditary conditions produce hearing loss at birth or later in life due to secondary degeneration of the inner ear structures. These usually occur as recessive conditions that often skip generations within a family. One of the most common of these conditions is Waardenburg's syndrome. Affected people often have eyes of different color, a white forelock, wideset eyes and progressive hearing loss. Usher's Syndrome (retinitis pigmentosa) and Alport's Syndrome (deafness and kidney disease) and other important genetic causes of deafness.

Meniere's Disease: Meniere's disease is a common condition caused by changes in the chemical composition and volume of

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Hearing Loss –

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fluid within the inner ear. The disease tends to affect only one ear and cause episodic spells of severe dizziness (vertigo) and hearing loss, which fluctuates but over time gradually deteriorates. The cause is unknown. Medical or, if necessary, surgical treatment usually controls the vertiginous spells. Medical therapy is directed toward salt restriction and fluid control and is successful in 70% of cases. For the remainder, surgical therapy is highly effective in relieving the spells of vertigo that often keep people with Meniere's disease from working.

NOISE-INDUCED HEARING LOSS

We live in a very noisy world and it is clear that our hearing suffers as a result. Long-term overexposure to hazardous noise will produce a typical high-frequency sensory loss resulting from permanent damage of the cochlear outer hair cells. Hearing protection and noise-reduction techniques prevent this from happening. Gun-shooting and industrial noise are the most common causes of noise-induced hearing loss and rock musicians often have hearing loss due to high sound levels of their amplified music.

NEURAL HEARING LOSS

When a hearing loss results from a problem with the auditory nerve, it is referred to as a neural hearing loss. Its most important cause is the acoustic neuroma, a benign tumor that grows on the vestibular (balance) nerve and presses upon the auditory nerve. Early detection and prompt removal of the tumor is curative and may prevent future hearing loss.

The acoustic reflex is a way of testing for neural hearing loss. The stapedius is a small muscle attached to the stapes that contracts in response to any loud sound, thus protecting the ear. The level of sound required to elicit this acoustic reflex can be used as a rough measure of hearing sensitivity. If the middle ear is normal, absence of the acoustic reflex may indicate a neural type of hearing loss. Interestingly, the reflex will remain at normal levels even with severe cochlear hearing loss but tends to disappear with mild neural losses.

Neural hearing loss is also characterized by a greater loss of speech discrimination than experienced with sensory loss.

CENTRAL AUDITORY DYSFUNCTION

Central auditory dysfunction refers to auditory impairment resulting from problems in the brain. Fortunately central problems are uncommon. While they cause communication difficulties, they do not cause deafness because they usually affect only one side of the brain: both sides of the brain are involved in hearing. Central auditory dysfunction can result from aging, from Alzheimer's disease and from other uncommon problems.

Presbycusis: Age-related hearing loss is called presbycusis (presby = elder, cusic = hearing). Everyone who lives long enough will develop some degree of age-related hearing loss. Those who damage their ears through noise develop it sooner and people who live in noisy societies have more presbycusis than those who live in quiet environments.

Presbycusis is the most common form of hearing loss and is thought to be due to the combined effects of intrinsic aging of the peripheral or central auditory systems, the accumulated effects of wear-and-tear. Most cases of presbycusis include high-frequency sensitivity loss, which disrupts speech comprehension in proportion to the sensitivity loss. The condition worsens with age.

Two major forms of presbycusis are sensory and strial. The sensory form is due to loss of outer hair cells in the inner ear and is associated with high-frequency loss. Most people with sensory presbycusis can hear speech but have difficulty in understanding it. That is, their auditory sensitivity is satisfactory but speech discrimination (which depends upon high frequency hearing ability) is reduced. Fortunately, modern hearing aids can correct the high-frequency loss and provide great benefit to the wearer.

The strial or

metabolic form of presbycusis is less common and affects both the low and high frequencies. This form of hearing loss is due to pathology of the stria vascularis, which, through its metabolism, is the source of electrical energy driving the cochlea. Recently, it has been shown that strial presbycusis, which is more common in women than in men, is associated with cardiovascular disease. Although unproven as yet, it may be the case that measures to prevent cardiovascular disease, such as fitness and exercise, weight reduction, lowering of high cholesterol levels, smoking cessation and diet modification, may delay its onset. This appears to be a logical but untested hypothesis.

Tinnitus: Tinnitus or ringing in the ears is a very common problem. Tinnitus may be intermittent or constant in character, mild or severe in intensity, and vary from a low hiss to a high-pitched tinkling or ringing type of sound. It may be subjective (audible only to the patient) or objective (audible to others). Tinnitus is usually associated with hearing loss. In fact, in many cases, the first symptom of the hearing loss is tinnitus.

163 Yard Par 3 eighth hole at the Refuge Golf Club in Oak Grove, Minnesota.



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