

SOLUTIONS TO AUDITORY CLINICAL CASE PROBLEMS

CASE 1: TYMPANIC MEMBRANE RUPTURE

Otoscopic evaluation: Tympanic membrane rupture.

Type of hearing loss: Conductive.

What do you base your conclusions on?: Physical evidence from otoscopy.

Pathophysiology:

Rupturing the tympanic membrane interferes with the efficiency of sound transmission to the inner ear by:

Reducing the effective area of the tympanic membrane and thereby reducing the hydraulic press effect.

Allowing the sound to enter the middle ear space and impinge on both the round and oval windows simultaneously, thereby canceling the push-pull arrangement of the stapes and the round window.

Follow-up otoscopic examination: Tympanic membrane healed, but scarred.

Audiogram: Fall in sensitivity for air conduction.

Type of hearing loss: Conductive.

What do you base your conclusions on? Audiogram.

Pathophysiology:

Tympanic membrane had healed but had lost some of its compliance. Also, there may have been a dislocation of the ossicles. This would appear as a conductive hearing loss.

CASE 2: OTITIS MEDIA

Otoscopic evaluation: Bulging tympanic membrane.

Audiogram: At this later point in the course of this condition, the audiogram shows normal bone conduction and decreased air conduction sensitivity, especially at high frequencies (air-bone gap). This reflects the increased mass of mucous within the middle ear. If an audiogram had been taken early in the course of this condition, it would have shown instead decreased air conduction sensitivity greatest at low frequencies, reflecting the increased stiffness as the negative pressure pulled the tympanic membrane inward.

Type of hearing loss: Conductive.

What do you base your conclusions on? History of upper respiratory disease, audiogram shows conductive loss, tympanic membrane bulging.

Pathophysiology:

Fluid in the middle ear impairs the transmission of sound in the middle ear. Upsets the impedance matching ability of the middle ear.

CASE 3: ACOUSTIC TRAUMA

Otoscopic evaluation: Unremarkable.

Audiogram: Air conduction and bone conduction same (no air-bone gap). Notched loss around 4 kHz.

Type of hearing loss: Sensorineural.

What do you base your conclusions on? History of exposure to intense sound, audiogram showing characteristic notch at 4 kHz, otoscopy showing intact tympanic membrane.

Pathophysiology: Destruction of hair cells of organ of Corti, centered in the region of the cochlea representing 4 kHz.

CASE 4: PRESBYCUSIS

Otoscopic evaluation: Unremarkable.

Audiogram: Air conduction and bone conduction show comparable hearing loss with no air-bone gap. Audiogram slopes steeply toward high frequencies.

Type of hearing loss: Sensorineural.

What do you base your conclusions on? History (age of patient, no recent history of trauma, general good health), audiogram (sensorineural hearing loss mainly in high frequency region).

Pathophysiology: Age related degeneration of hair cells, maximally in high frequency range (sensorineural).

CASE 5: RUBELLA

Otoscopic evaluation: Unremarkable.

Audiogram: Air conduction and bone conduction show profound hearing loss with no air-bone gap. Sloping toward high frequency.

Type of hearing loss: Sensorineural.

What do you base your conclusions on? History (disease during pregnancy), audiogram (pure sensorineural).

Pathophysiology: Sensorineural hearing loss due to viral destruction of organ of Corti in utero.

CASE 6: TRANSVERSE FRACTURE OF TEMPORAL BONE

Otoscopic evaluation: Unremarkable.

Audiogram: Profound hearing loss at all frequencies with very small air-bone gap.

Type of hearing loss?: Sensorineural (with possible small conductive component).

What do you base your conclusions on? Recent history of trauma to head, no prior history of hearing problems, audiogram showing severe sensorineural hearing loss.

Pathophysiology: Fracture of temporal bone results in physical rupture of the cochlea with damage or destruction of organ of Corti. Small conductive component may have resulted from physical trauma to the ossicles.

CASE 7: OTOSCLEROSIS

Otoscopic evaluation: Tympanic membrane normal in appearance.

Audiogram: Hearing loss at all frequencies, but greater at low frequencies. Nearly normal bone conduction with a large air-bone gap.

Type of hearing loss?: Conductive.

What do you base your conclusions on? History (runs in family, progresses over time), gender (affects women more than men), age (usually in the 30's and 40's), audiogram. The audiogram shows a conductive hearing loss with notable air/bone gap and a stiffness lesion pattern (greatest hearing loss at low frequencies).

Pathophysiological mechanisms: Fixation of stapes footplate in the oval window. Reduces sound transmission in the middle ear.

CASE 8: MENIERE'S DISEASE

Otoscopic evaluation: Unremarkable.

Audiogram: Air conduction and bone conduction show significant hearing loss greatest at low frequencies with no air-bone gap.

Type of hearing loss?: Sensorineural.

What do you base your conclusions on? History (constellation of symptoms, including hearing loss; the timing and pattern of recurring symptoms). Audiogram shows pure sensorineural hearing loss. Meniere's Disease is one of the few examples of a sensorineural hearing loss with greatest loss at low frequencies. The reason why low frequencies are most affected is unclear.

Pathophysiology: Thought to involve an abnormality in the production or regulation of endolymph. Temporal bone studies indicate an expansion of the endolymphatic space, possibly due to decreased resorption of endolymph, thus the general term "endolymphatic hydrops".

