

Diseases of the inner ear:

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Diseases of the inner ear:

- ❖ **Vertigo**

- Epidemiology

- Dizziness and vertigo are among the most common symptoms causing patients to visit a physician (as common as back pain and headaches).

- The overall incidence of dizziness, vertigo, and imbalance is 5-10%.

- It reaches 40% in patients older than 40 years.



Onset:

- Sudden onset of vertiginous episodes are often due to inner ear disease, especially if hearing loss, ear pressure, or tinnitus is also present.
- Gradual and ill defined symptoms are common in CNS, cardiac, and systemic diseases.



Time course:

- ▶ Episodic true vertigo that lasts for seconds and is associated with head or body position changes is probably due to benign paroxysmal positional vertigo (BPPV).
- ▶ Vertigo that lasts for hours or days is probably caused by Ménière disease or vestibular neuronitis .
- ▶ Vertigo of sudden onset that lasts for minutes can be due to brain or vascular disease, especially if cerebrovascular risk factors are present



CNS symptoms:

- ▶ Brainstem characteristics, including diplopia, autonomic symptoms, nausea, dysarthria, dysphagia, or focal weakness.
- ▶ Patients with cerebellar disease are frequently unable to ambulate during acute episodes of vertigo. Patients with peripheral vertigo can usually ambulate during episodes and are consciously aware of their environment.
- ▶ A history of headaches, especially migraine headaches, can be associated with migraine related dizziness.

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- ▶ Previous viral illness, cold sores, or sensory changes in the cervical C2C3 or trigeminal distributions usually indicate vestibular neuronitis or recurrent episodes of Ménière disease.
 - ▶ head trauma
 - ▶ ear diseases, trauma, or surgery
 - ▶ History of prescription medicines, overthecounter medications, herbal medicines, and recreational drugs (including smoking and alcohol) can help to identify pharmacologically induced syndromes
 - ▶ DM, HTN, or any cardiovascular or cerebrovascular disease.

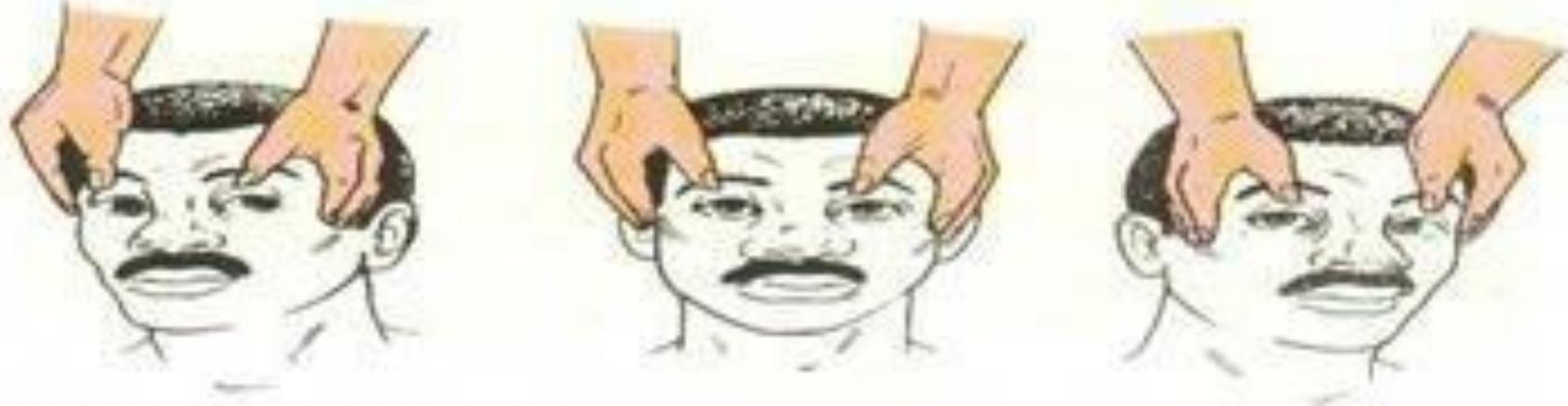


Physical examination

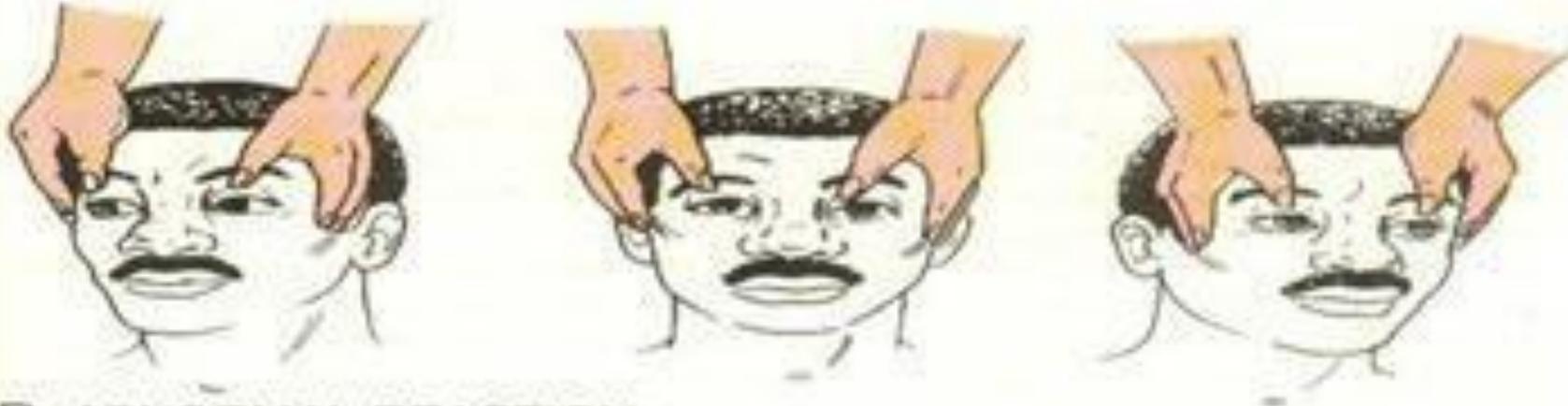
- ▶ Supine and standing bloodpressure measurement.
- ▶ Evaluation of the cardiovascular and neurologic systems.
- ▶ Examine the ears for visible infection or inflammation of the external or middle ear. Test hearing and discrimination by using a tuning fork and by whispering and asking the patient to repeat heard words.
- ▶ Examine the neck for range of motion and flexibility.
- ▶ Focused neurologic examination of the cranial nerves, motor and sensory modalities and gait.

Vestibular examination

- ▶ 1. The vestibuloocular reflex (VOR)
- ▶ It is a reflex eye movement that stabilizes images on the retina during head movement by producing an eye movement in the direction opposite to head movement, thus preserving the image on the center of the visual field. For example, when the head moves to the right, the eyes move to the left, and vice versa. Since slight head movements are present all the time, the VOR is very important for stabilizing vision
- ▶ patients whose VOR is impaired find it difficult to read, because they cannot stabilize the eyes during small head tremors. The VOR reflex does not depend on visual input and works even in total darkness or when the eyes are closed.



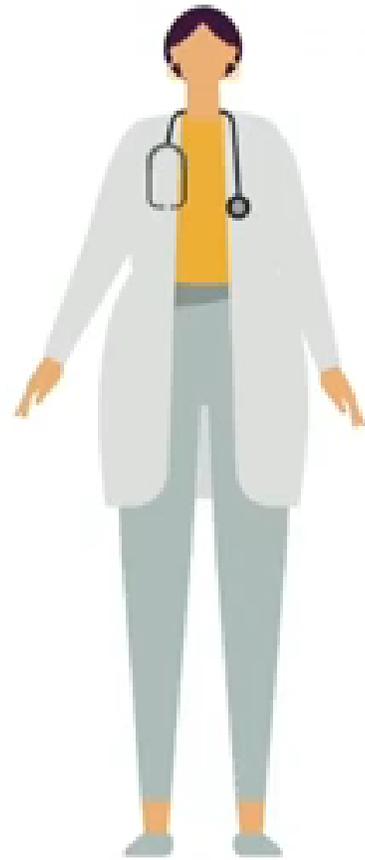
A. NORMAL REACTION:
Eyes move from side to side when head is turned



B. ABNORMAL REACTION:
Eyes remain in fixed position in skull when head is turned

Vestibulospinal reflex (VSR)

- ▶ It can be examined with Romberg and gait tests.
- ▶ These tests provide information about the patient's postural stability when his or her visual and proprioceptive inputs are removed.
- ▶ Posture and gait:
- ▶ Ask the patient to repeatedly run the heel from the opposite knee down the shin to the big toe, and look for incoordination.
- ▶ Watch the patient walking, performing tandem gait. The normal gait is characterized by an erect posture, moderately sized steps, and the medial malleoli of the tibia tracing a straight line.
- ▶ The Romberg examination is conducted by asking the patient to stand with the heels together, first with eyes open, then with eyes closed. Then, ask the patient to stand on a high-compliance surface and note any excessive postural sway, posteroanterior or to one side





Fixation suppression test:

- ▶ It is important for checking the vestibulocerebellum.
- ▶ Failure of fixation suppression can be tested by asking the patient to stretch his arms and look at his thumb while being passively rotated (manual rotation of examination chair). A visible
- ▶ nystagmus (right or left) indicates failure of fixation suppression that is always central in origin.



VESTIBULAR SYSTEM 5

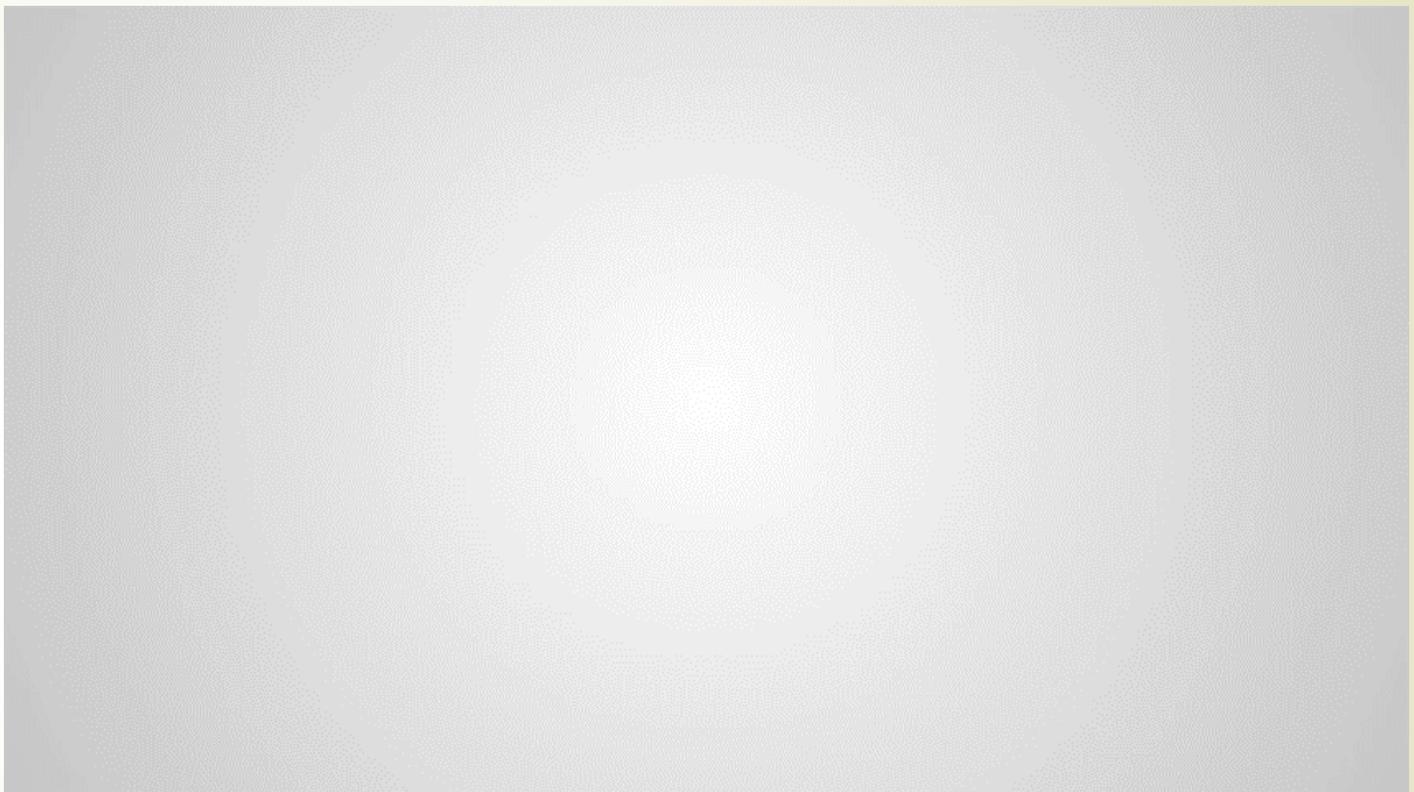
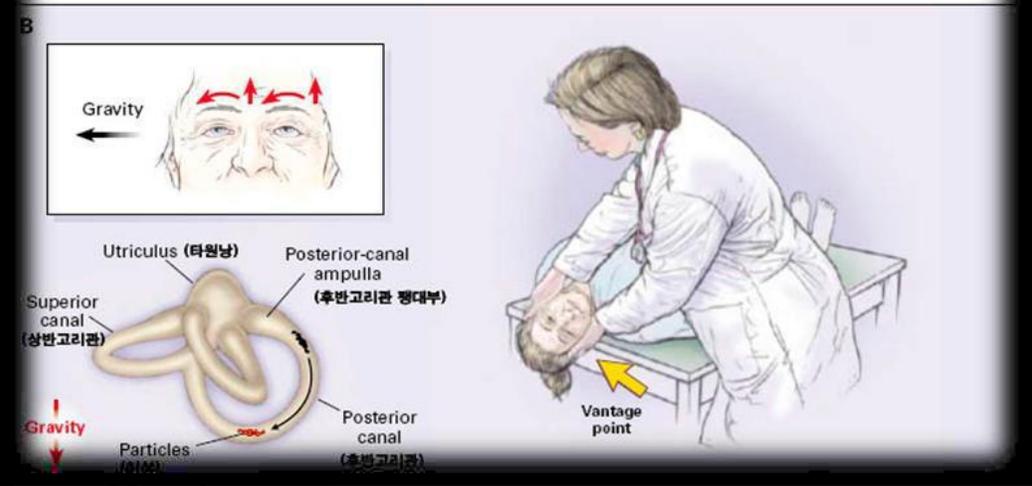
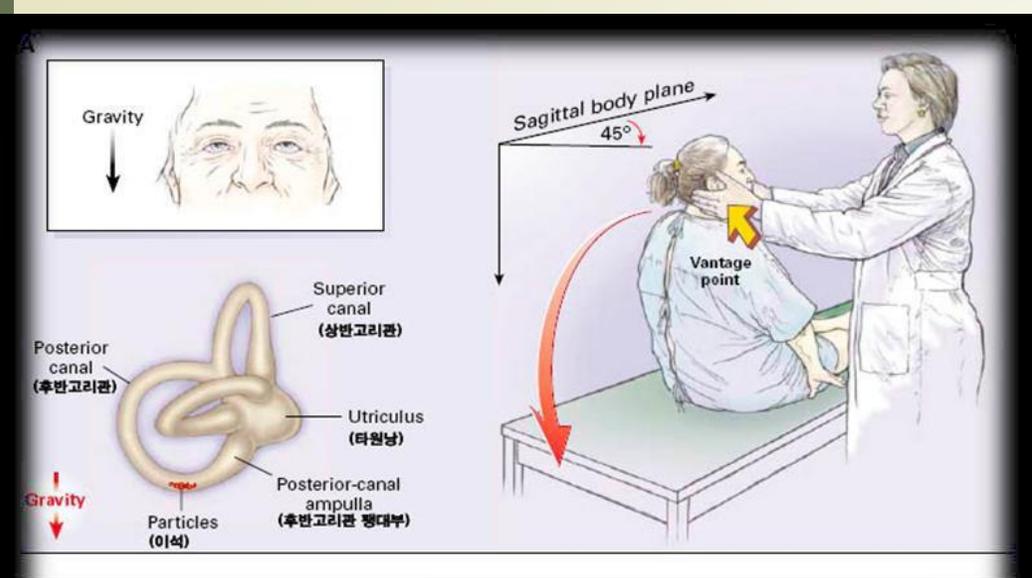
Visual fixation suppression
of the VOR
(Vestibulo Ocular Reflex)



Positioning examination

- ▶ The positioning examination (DixHallpike test) is an important component of the vestibular examination to identify BPPV commonly caused by otolith debris (canalith) floating in the semicircular canals (canalithiasis)
- ▶ The DixHallpike maneuver is performed by guiding the patient rapidly from a sitting position with the head turned 45° to one side to a supine position.
- ▶ BPPV is due to posterior semicircular canal canalithiasis approximately 90% of the time.
- ▶ Typical nystagmus related to posterior semicircular canal benign positioning and its symptoms are delayed by several seconds (latency). They peak in 20-30 seconds and then decay (paroxysmal), with complete resolution of symptoms while the patient maintains the same head position

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- ▶ Therefore, benign positioning nystagmus is latent, paroxysmal, geotropic, reversible, and fatigable





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- ▶ Caloric test examination
 - ▶ *Electronystagmography(ENG)*



Differential diagnosis of dizziness

- ▶ *Cardiovascular causes:*
- ▶ Arrhythmias (fast or slow rate).
- ▶ Orthostatic hypotension.
- ▶ Hypovolemia or anemia.
- ▶ Myocardial ischemia.
- ▶ Structural cardiac or valvular disease.
- ▶ Hypoxia.
- ▶ Vasovagal episode (also neurologic)

Neurologic Otologic causes:

- ▶ □ Peripheral vestibular causes:
 - ▶ Vestibular neuritis.
 - ▶ Benign Paroxysmal Positional Vertigo (BPPV).
 - ▶ Ménière's disease.
- ▶ □ Central vestibular causes:
 - ▶ CVA
 - ▶ Vertebrobasilar ischemia.
 - ▶ Cerebellopontine angle mass.
 - ▶ Multiple sclerosis.
 - ▶ Basilar artery migraine.



Other

- ▶ Drug effects:
- ▶ Aminoglycosides.
- ▶ Anticonvulsants.
- ▶ Antihypertensives.
- ▶ Hypoglycemic.
- ▶ Antipsychotics.
- ▶ Sedative/hypnotics.
- ▶ Alcohol.
- ▶ Psychiatric (hyperventilation, anxiety)
- ▶ Thyroid disorders

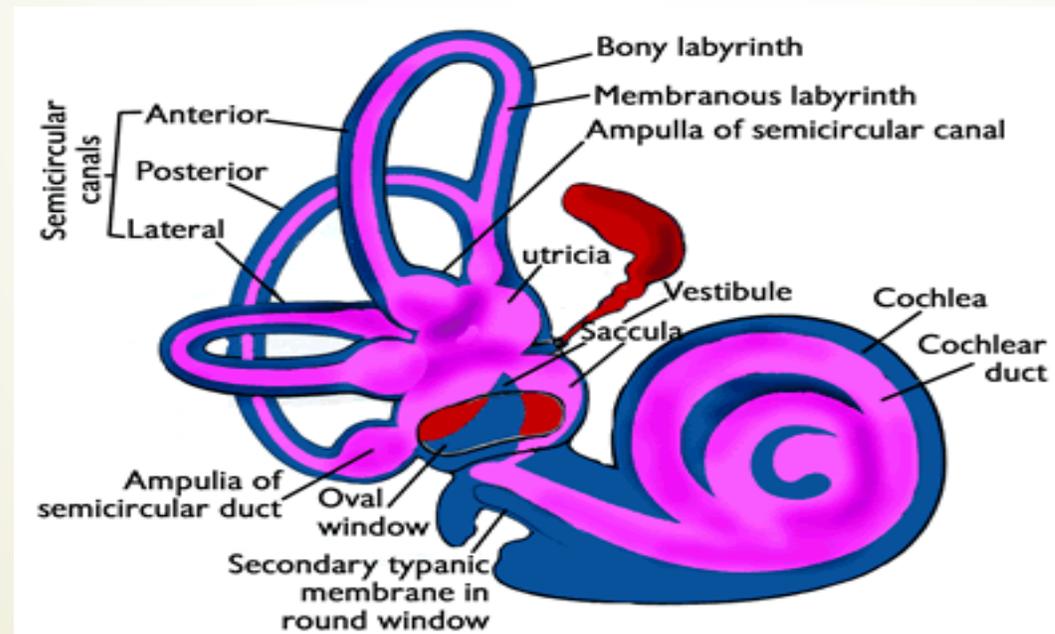


Labyrinthitis

LABYRINTHITIS

An infection or inflammation that affecting either labyrinth or surroundings.

2nd most common cause of acute vertigo, with an incidence of 170 cases per 100,000 people.





➤ ***Etiology:***

- **infection** include bacteria, fungus, viruses, and prolozoa.
- **autoimmune.**
- **Trauma.**
- **Systemic diseases**, like diabetes , stomatitis,...

➤ There are three routes in which the infection can spread to the labyrinth:

➤ 1) **Tympanogenic labyrinthitis**

➤ The spread of infection or toxin or inflammation from the middle ear to the inner ear via either oval or round windows, round window is the much more significant in this pathologic process.

➤ **General symptoms:**

➤ 1-typically unilateral.

➤ 2-typically patients will have SNHL.

➤ 3-vertigo.

➤ Types of tympanogenic labyrinthitis :

➤ **1-Acute toxic form (serous labyrinthitis)**

- The labyrinth itself is **not** affected , it becomes inflamed by substances that are released in the ME (ex. Inflammatory mediators or bacterial toxins).it is probably involved in viral tympanogenic infections (ex. In bullous of otitis externa).
- SNHL may fluctuate and is less severe than that often seen in suppurative labyrinthitis.

➤ 2- Acute suppurative form

- A bacterial infection of the ME spreads to involve the labyrinth.
- When suppurative labyrinthitis occurs, it is almost always associated with **cholesteatoma**. Profound hearing loss, severe vertigo, ataxia, and nausea and vomiting are common symptoms of bacterial labyrinthitis, and often results in **permanent HL** and vestibular function.
- Also it can lead to **meningitis**.

▶ 3- Chronic labyrinthitis

- ▶ This may eventually be manifested as inner ear damage.
- ▶ Chronic otitis media is among the possible causes.

Symptoms:

- ▶ vertigo.
- ▶ After a period of gradual recovery that may last several weeks, some people are completely free of symptoms. Others have chronic dizziness if the virus has damaged the vestibular nerve.
- ▶ Many people with chronic labyrinthitis have difficulty describing their symptoms, and often become frustrated because although they may look healthy, they don't feel well. Without necessarily understanding the reason, they may observe that everyday activities are fatiguing or uncomfortable, such as walking around in a store, using a computer, being in a crowd, standing in the shower with their eyes closed, or turning their head to converse with another person at the dinner table.
- ▶ Some people find it difficult to work because of a persistent feeling of disorientation or "haziness," as well as difficulty with concentration and thinking.

Meningeal Labyrinthitis

- ▶ The labyrinth may be infected bilaterally (often with streptococcus pneumonia) from the intracranial space, possibly through a patent cochlear aqueduct.
- ▶ Accompanying feature of meningitis.
- ▶ Often occurring in infants and small children, but also occurring in adults.
- ▶ Lead to complete deafness and calcification of the labyrinth.



Hematogenous Labyrinthitis

- ▶ Viruses and bacteria (rare) infection.
- ▶ Resulting in hearing loss and disequilibrium.
- ▶ Causes:
 - 1-Mumps
 - 2-Measles
 - 3-Human immunodeficiency virus(HIV)
 - 4-Cytomegalovirus
 - 5-Spirochetes(syphilis,)

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- ▶ Audiometry shows signs of SNHL with tympanogenic labyrinthitis .

High resolution CT scan of the temporal bone

- ▶ Cerebrospinal fluids sampling should be performed if there is the least suspicion of meningitis.



Symptoms

- _Hearing loss
- _Tinnitus which is characterized by a ringing or buzzing in your ear
- _nausea and vomiting
- _dizziness marked by the sensation that you're moving
- _Vestibular symptoms (vertigo, nystagmus, disequilibrium)



WARNING SIGN!!!

If a patient with otitis media show up vestibular symptoms ,this is an indication of labyrinthitis.

An immediate otologic work up and appropriate treatment is essentially required.



Prognosis

Some recovery of inner ear function is possible , but most patient are left with permanent residual damage.

Recovery from severe functional deficits is rare.



Treatment:

1- Tympanogenic labyrinthitis (in acute otitis media):

- ➔ careful decompression of the ME
- ➔ myringotomy tube
- ➔ either alone or with mastoidectomy

2-labyrinthine fistula:

- ➔ immediate surgical

Bacterial:

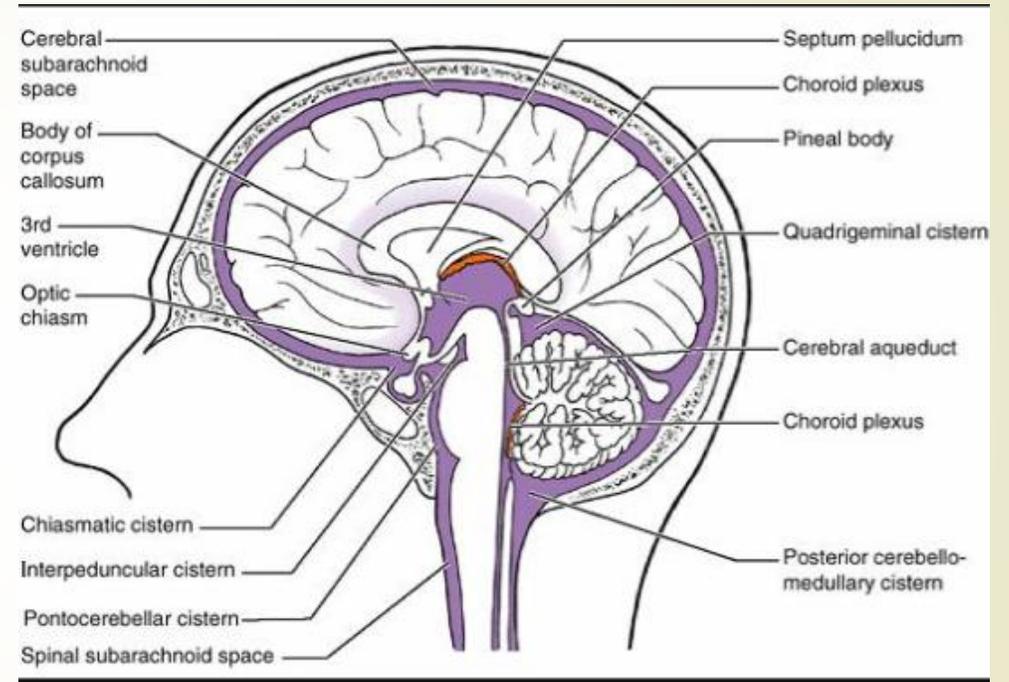
Antibiotics

usually administered intravenously

enter  subarachnoid space

Viral or toxic etiology:

corticosteroids





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