

Disorders of Vestibular System

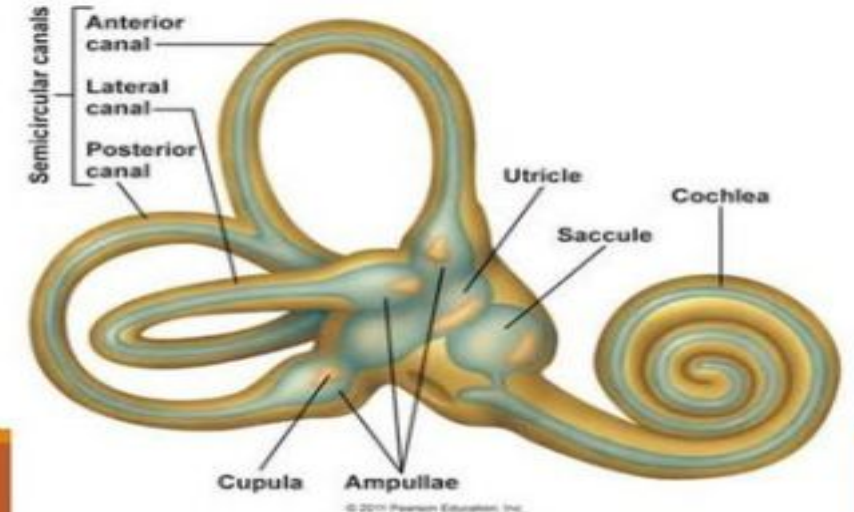
(Dizziness)



By: Dr Hythame F. El malahi

Vestibular System

- Which are responsible for making compensatory movements and adjustments in body position.
- The membranous labyrinth of the inner ear consists of three semicircular ducts (horizontal, anterior and posterior), two otolith organs (saccule and utricle), and the cochlea.



Pathologies

Diseases of the vestibular system can take different forms, and usually induce vertigo and instability or loss of balance, often accompanied by nausea.

Disorders of vestibular system

Disorders of vestibular system cause vertigo.

Divided into:

1. Peripheral, which involve vestibular end organs and their 1st order neurons (i.e. the vestibular nerve). The cause lies in the internal ear or the Vestibulocochlear nerve.

They are responsible for 85% of all cases of vertigo.

2. Central, which involve central nervous system after the entrance of vestibular nerve in the brainstem and involve vestibulo-ocular, vestibulo-spinal and other central nervous system pathways.

CENTRAL VESTIBULAR DISORDERS:

1. Vertebrobasilar insufficiency.
2. Posteroinferior cerebellar artery syndrome (Wallenberg syndrome).
3. Basilar migraine.
4. Cerebellar disease.
5. Multiple sclerosis.
6. Tumours of brainstem and floor of IVth ventricle.
7. Epilepsy.
8. Cervical vertigo.

PERIPHERAL VESTIBULAR DISORDERS:

1. Benign paroxysmal positional vertigo (BPPV).
2. Ménière's disease (endolymphatic hydrops).
3. Vestibular neuronitis.
4. Labyrinthitis.
5. Vestibulotoxic drugs.
6. Head trauma.

OTHER CAUSES OF VERTIGO

1. Ocular vertigo.
2. Psychogenic vertigo.

Benign paroxysmal positional vertigo (BPPV)

**“I feel like the room is
spinning when I turn
my head”**

Typical complain

Definition:

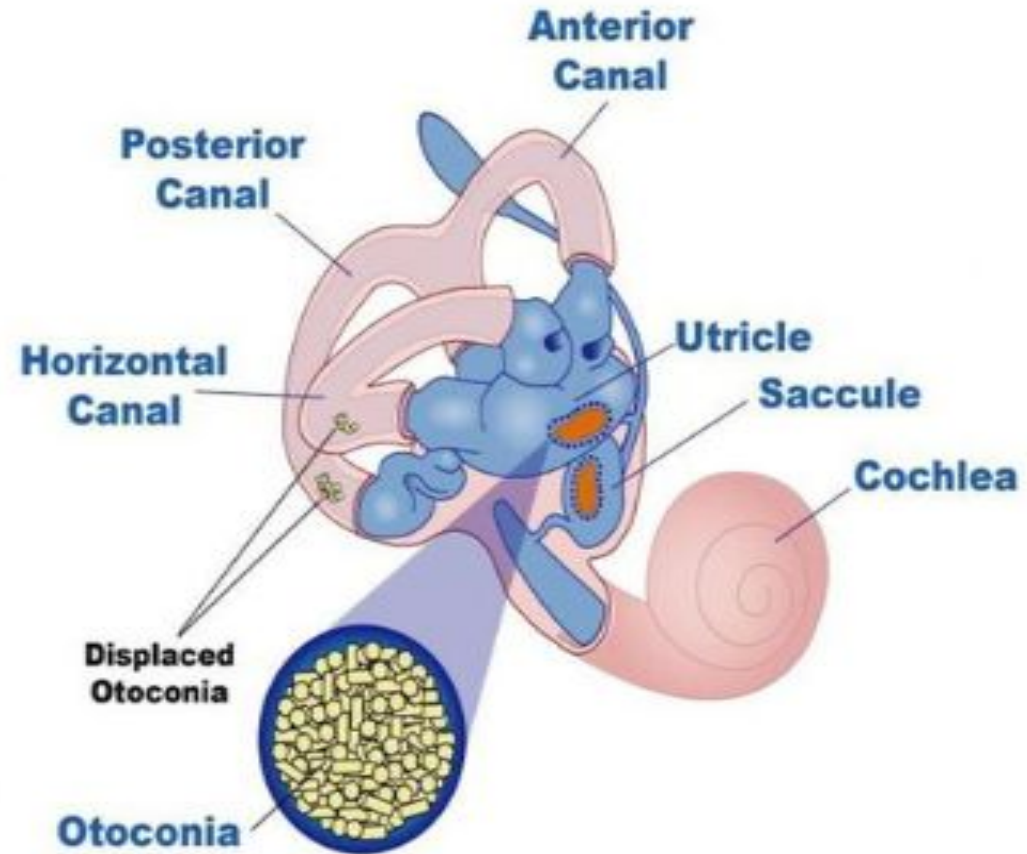
It's A self-limiting condition characterized by episodic vertigo and nystagmus of brief (seconds) duration, provoked by very specific head position.

Most common peripheral vestibular disorder.

Pathophysiology :

A disorder of posterior semicircular canal, the otoconial debris which consisting of crystal of calcium carbonate released from utricle and floats freely till settles on the cupula of posterior semicircular canal in a critical head position

There's no hearing loss or other neurological symptoms (tinnitus)

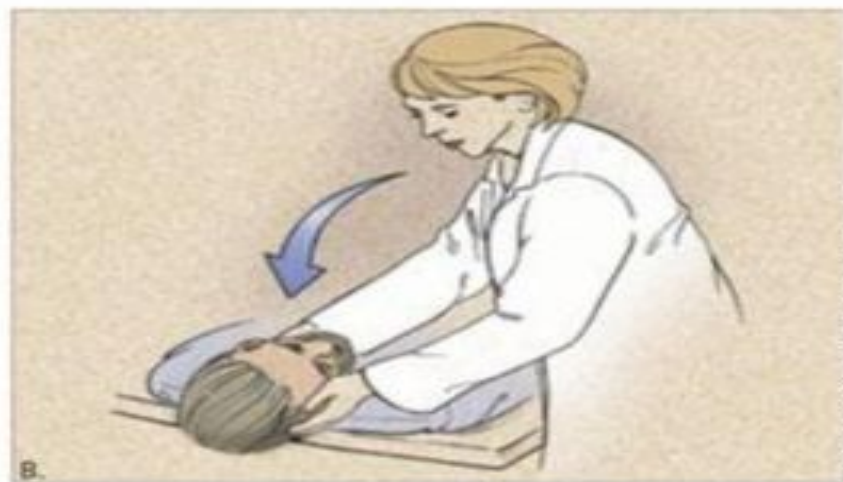


Clinical features:

Vertigo- nystagmus - Light-headedness - Imbalance - Nausea

Diagnosis:

- by taking history: BPPV patients have history of ear infections and head trauma or just the normal aging.
- Dix Hallpike maneuver.



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Dix Hallpike maneuver

1. Patient should sit with their legs straight on an examination table. the doctor will turn patient's head 30° - 45° to one side, then quickly lie back with patient's head hanging over at the end of the table for about 20° .
2. Observe patient's eyes for involuntary movements (nystagmus) and identify the affected side
3. Then sit patient upright to recover from vertigo, and the procedure is repeated in the opposite direction

Treatment of BPPV:

1- Epley's Maneuver: Cannalith repositioning . otoconial debris travels through semicircular canal through series of rotational movements in the plane of canal to reach utricle.

2- A bone vibrator placed on the mastoid bone.

Epley's Maneuver Consists of five positions:

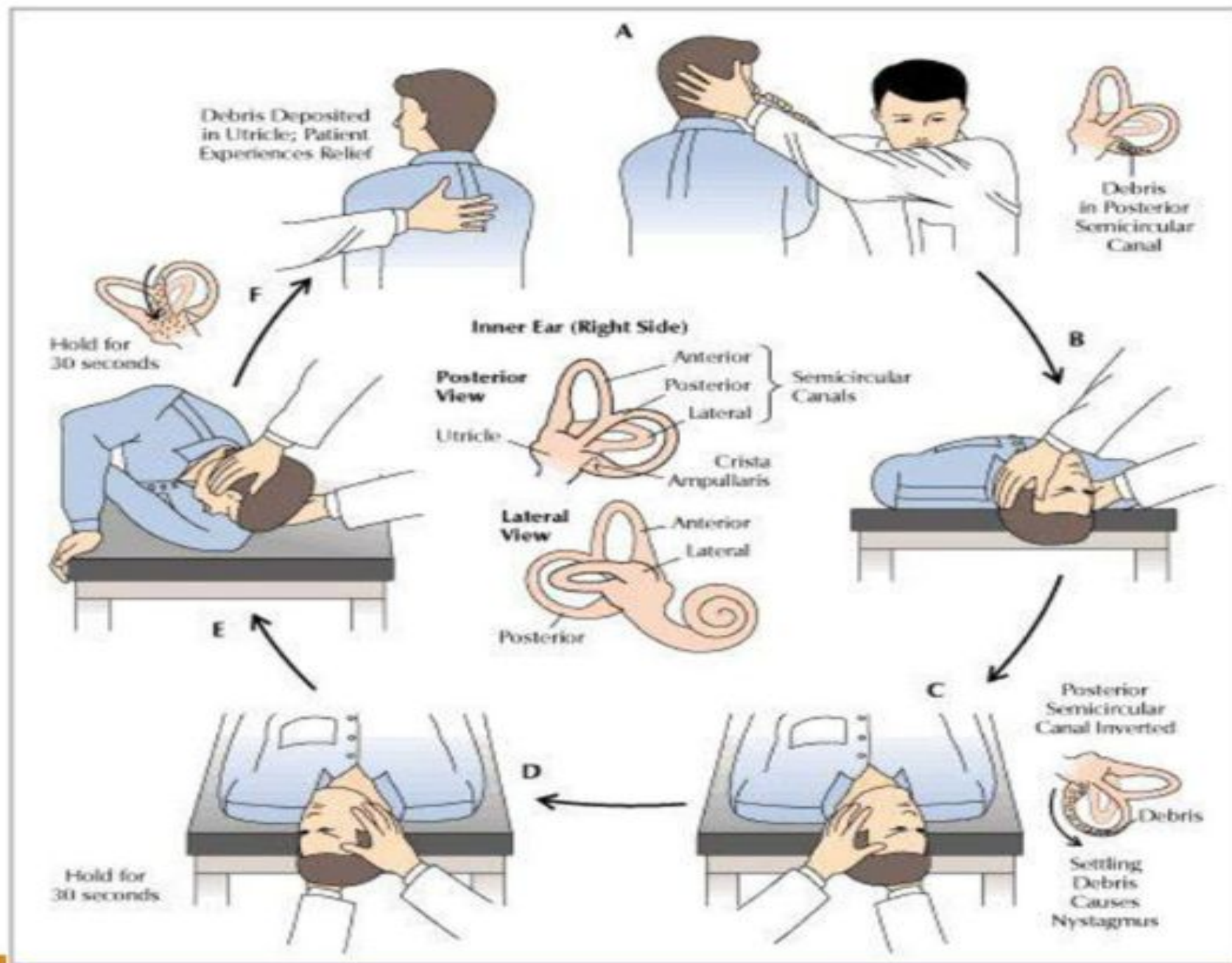
Position 1: with the head turned 45° to the affected side, the patient is made to lie down in head-hanging position, It will cause vertigo and nystagmus. Wait till they subside

Position 2: Head is now turned to the other side, so that affected ear is up.

Position 3: The whole body and head are now rotated away from the affected ear to a lateral recumbent position with face-down position.

Position 4: Patient is now brought to a sitting position with head still turned to the unaffected side by 45° .

Position 5: The head is now turned forward and chin brought down 20°



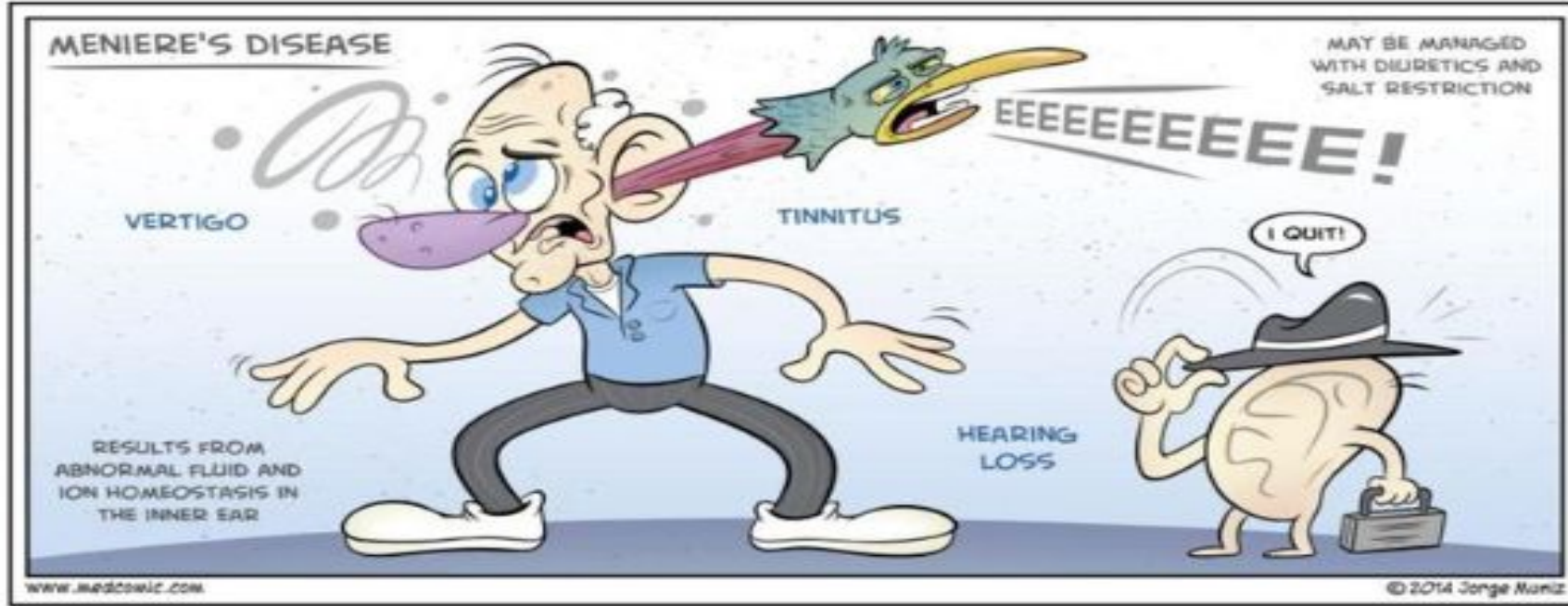
Cont.

- **There should be a pause at each position about 30 seconds till there is no nystagmus or there is slowing of nystagmus, before changing to the next position.**
- **80% of patients will be cured by single manoeuver. If the patient remains symptomatic, the manoeuver can be repeated.**

Post Maneuver Instructions :

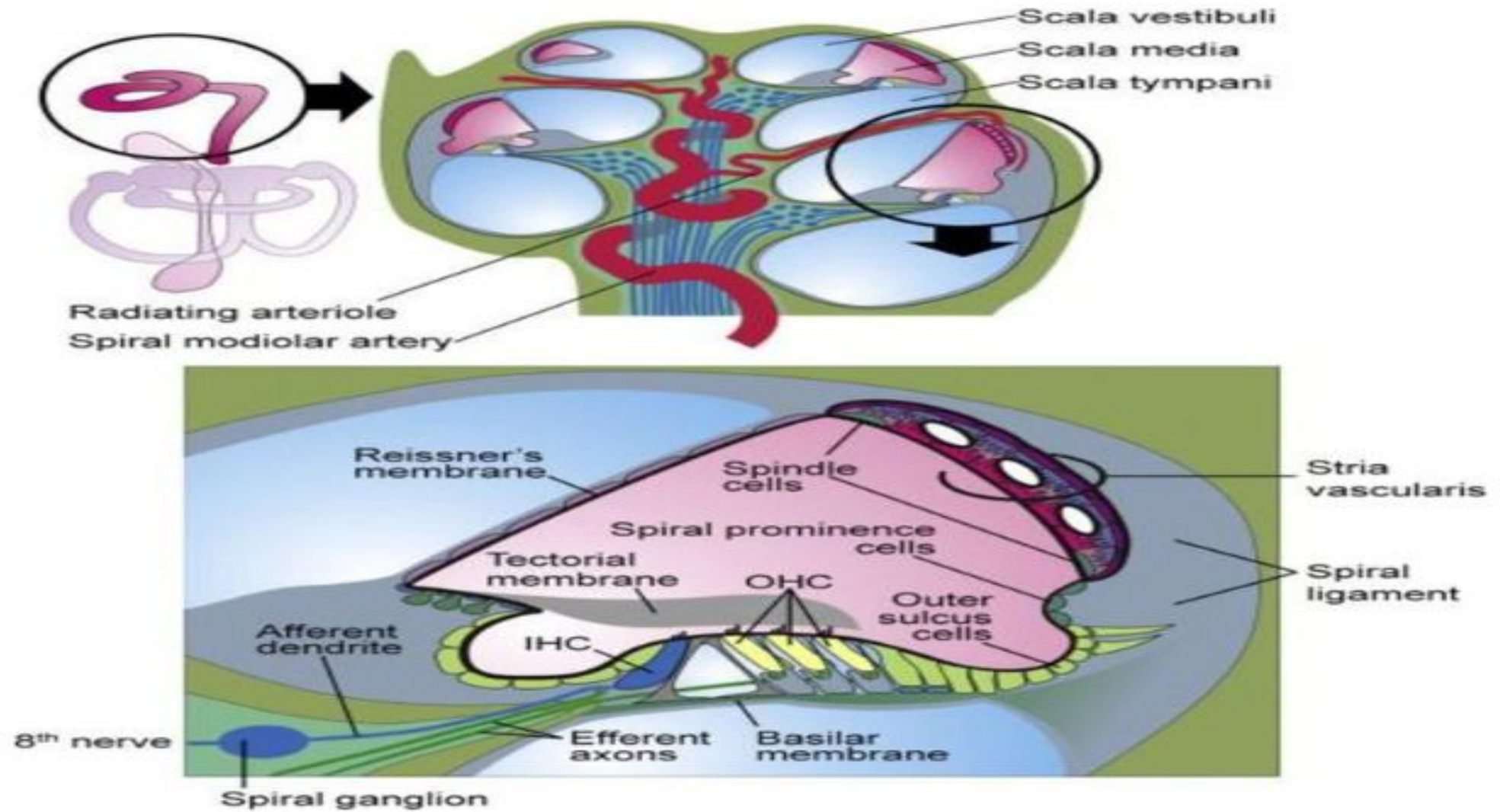
- 1) Wait for 10 Minutes after the maneuver is performed**
- 2) Don't let the patient to drive**
- 3) sleep semi-recumbent for the next two nights**
- 4) for at least one week, tell the patient to avoid provoking head positions**

Ménière's Disease



What is Ménière's disease?

a disorder of the inner ear caused by a change in fluid volume in the labyrinth.



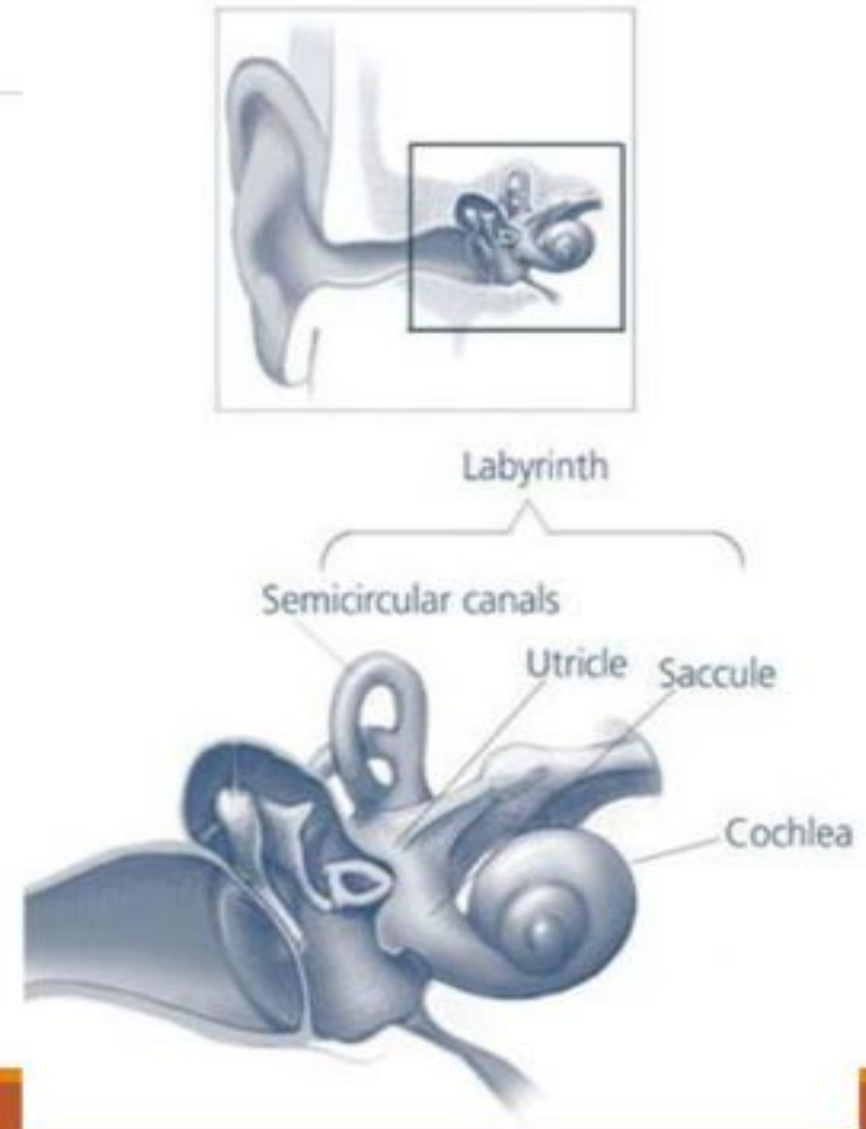
What causes the symptoms of Ménière's disease?

The labyrinth in relation to the ear

The labyrinth is composed of the semicircular canals, the otolithic organs (i.e., utricle and saccule), and the cochlea.

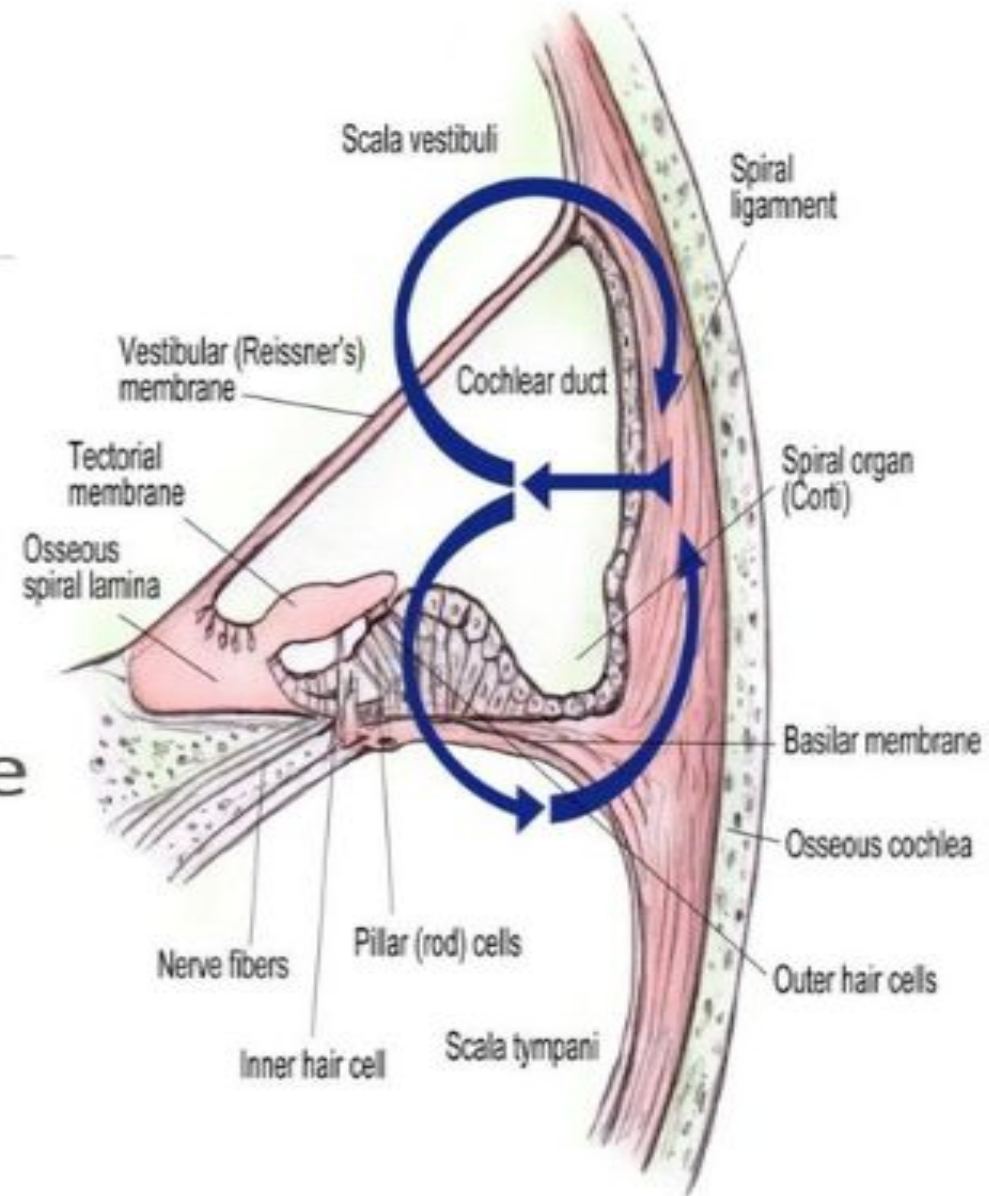
Inside their walls (bony labyrinth) are thin, pliable tubes and sacs (membranous labyrinth) filled with endolymph.

The symptoms of Ménière's disease are caused by the buildup of fluid in the compartments of the inner ear, called the labyrinth. The labyrinth contains the organs of balance (the semicircular canals and otolithic organs) and of hearing (the cochlea).



The distension of endolymphatic system is could be to :

- 1-Increased production of endolymph , which secreted by stria vascularis
- 2-Defective absorption by endolymphatic sac it could be due to the ischemia of sac.



3-Distension of membranous labyrinth leads to rupture of Reissner's membrane and thus mixing of (perilymph)resembles extracellular fluid and is rich in Na ions with (endolymph), resembles intracellular fluid, being rich in K ions which is thought to bring about an attack of vertigo

The exact cause of Ménière's disease is not yet known. Various theories have been postulated

- 1-Vasomotor disturbance. There is sympathetic overactivity resulting in spasm of internal auditory artery, thus interfering with the function of cochlear or vestibular sensory neuroepithelium
- 2-Allergy. The offending allergen may be a foodstuff or an inhalant. In these cases, inner ear acts as the “shock organ” producing excess of endolymph.
- 3-Sodium and water retention.
- 4-Hypothyroidism.
- 5-Autoimmune and viral etiologies

CLINICAL FEATURES

1. **Vertigo** : Acute attacks typically last minutes-hours, often 2-3 hours.

Usually, an attack is accompanied by nausea and vomiting with ataxia and nystagmus.

2. **Hearing loss** : fluctuating nature
3. **Tinnitus**.
4. **Sense of fullness or pressure**.

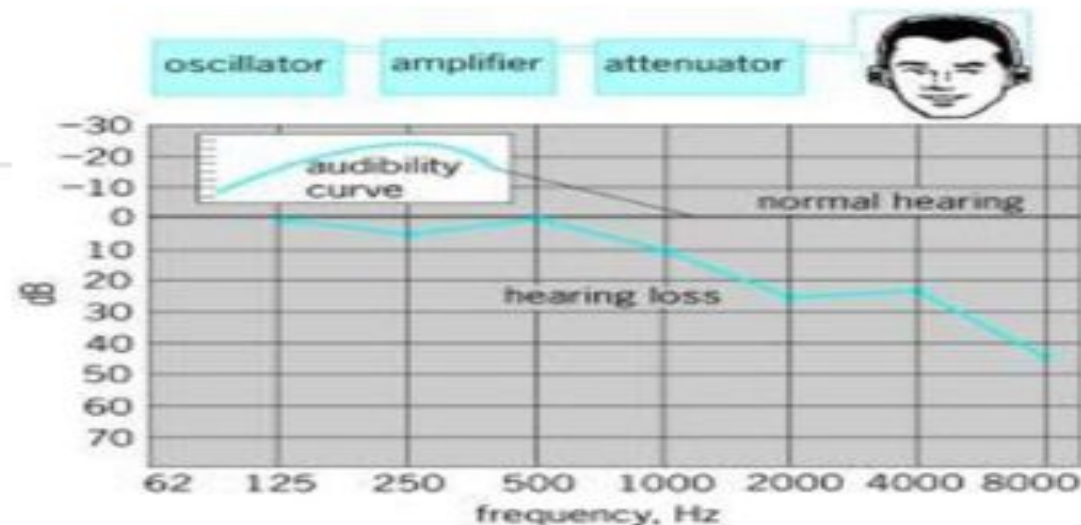
EXAMINATION

1. **Otoscopy.** No abnormality is seen in the tympanic membrane.
2. **Nystagmus.** It is seen only during acute attack..
3. **Tuning fork tests.** They indicate sensorineural hearing loss. Rinne test is positive, absolute bone conduction is reduced in the affected ear and Weber is lateralized to the better ear.

INVESTIGATIONS

1. Pure tone audiometry

During the early stages, hearing loss can be transient, making it difficult to confirm hearing impairment by audiometry. Serial audiograms may help.



2. Electrocochleograph

The electrocochleography test is an objective measure of the electrical potentials generated in the inner ear as a result of sound stimulation. This test is most often used to determine if the inner ear (cochlea) has an excessive amount of fluid pressure. It shows changes diagnostic of Ménière's disease. Normally, ratio of summing potential (SP) to action potential (AP) is 30%. In Ménière's disease, SP/AP ratio is greater than 30%

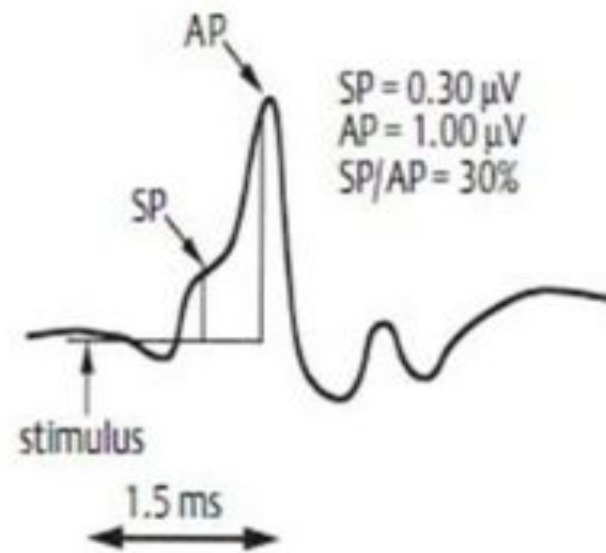
Diagnostic criteria

For a firm diagnosis, the following symptoms should be present:

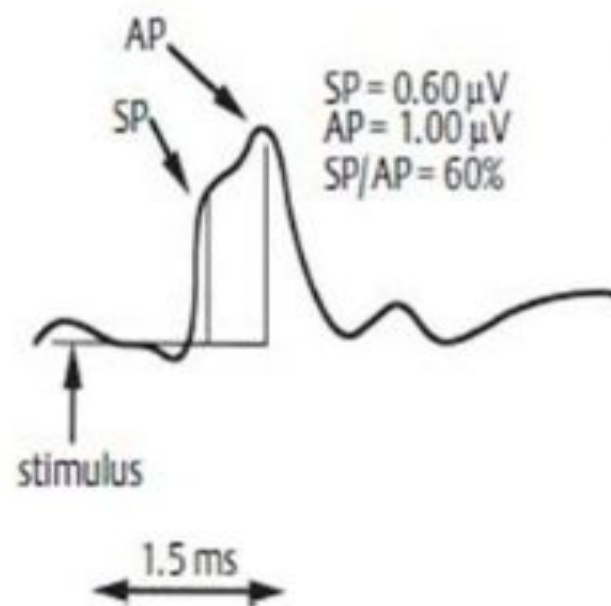
Vertigo - at least two spontaneous episodes lasting at least 20 minutes within a single attack of Ménière's disease.

Tinnitus and/or perception of aural fullness.

Hearing loss confirmed by audiometry to be sensorineural in nature.



Right ear
(normal)



Left ear
(Meniere's disease)

TREATMENT

A. GENERAL MEASURES

Reassurance.

Cessation of smoking

Low salt diet.

B. MANAGEMENT OF ACUTE ATTACK

-Vestibular sedatives : promethazine

-Vasodilators: Inhalation of carbogen (5% CO₂ with 95% O₂). It is a good cerebral vasodilator and improves labyrinthine circulation.

MANAGEMENT OF CHRONIC PHASE

1. Diuretics.

2. SURGICAL TREATMENT

- **Conservative procedures.** They are used in cases where vertigo is disabling but hearing is still useful and needs to be preserved.
- **They are:** (a) **Decompression of endolymphatic sac.** (b) **Endolymphatic shunt operation.**
- **Destructive procedures.** They totally destroy cochlear and vestibular function

THANK YOU.



