VERTIGO

Objectives:

- To know anatomy of balance organs.
- Physiology of balance.
- Relevant history in dizzy patients.
- Classification of vertigo.
- Common peripheral causes of vertigo, clinical features, investigation and management.
- Common central causes of vertigo, clinical features, investigation and management Vertigo Central Peripheral Meniere's disease BPPV Vestibular neuritis CVA Acoustic Neuroma Multiple Sclerosis Migraine.

[Color index : Important | Notes | Extra]

Resources: Slides+Lecture notes of ENT+Notes+433team.
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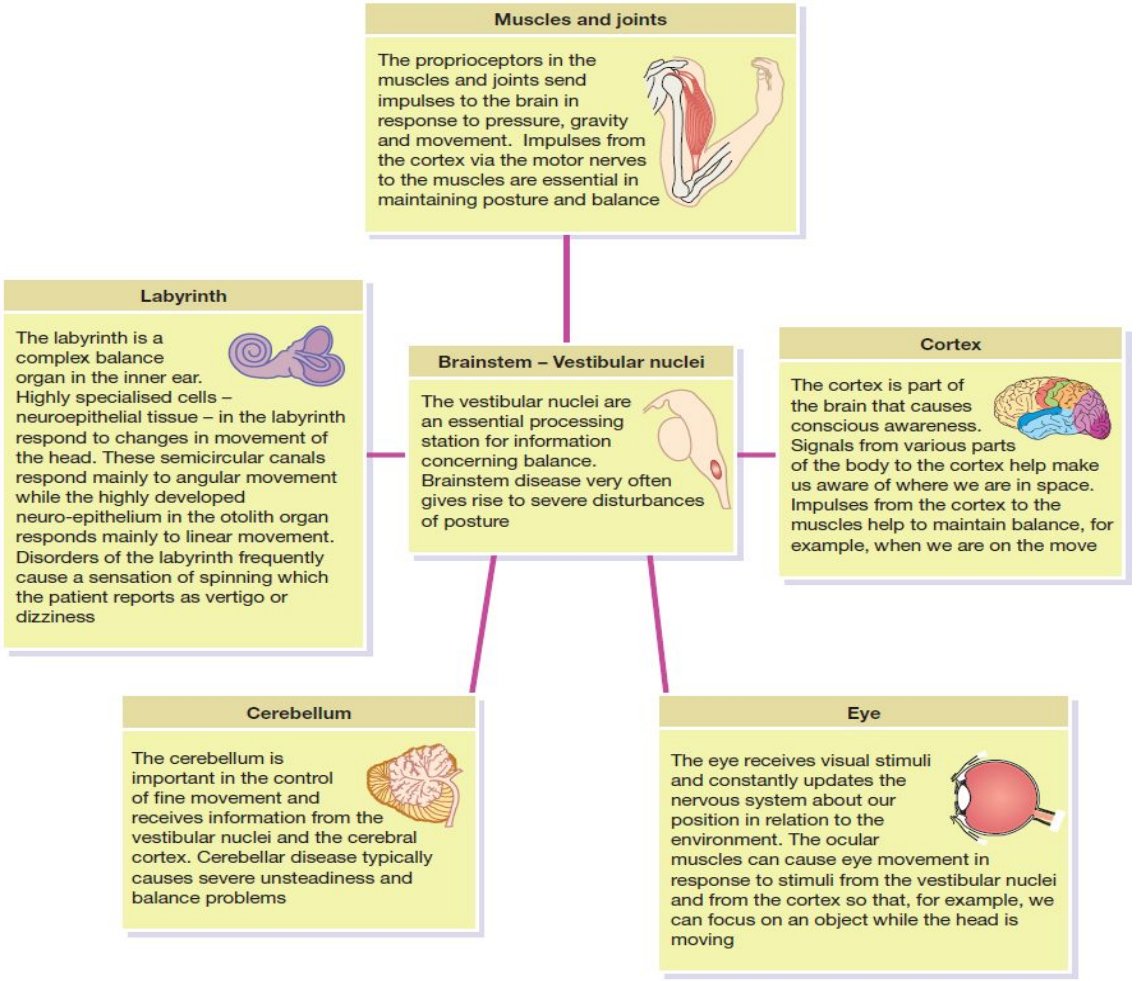
Introduction:

What are the balance organs ?

1. **Inner ear** (3 semicircular canals and otolith organ).
2. **Cerebellum.**
3. **Vision** (VOR-Vestibulo Ocular reflex):
    - To stabilize images on the retina during head movement by moving the eye in direction opposite to the direction of the head, thus keeping image on the center of the visual field.
    - The anatomical component of VOR are:
        - **a.** Semicircular canals.
        - **b.** Vestibular and oculomotor nuclei in the brainstem.
        - **c.** Extra-ocular muscles.
4. **Proprioception** (Muscles & Joints)**.**
5. Cerebral cortex.

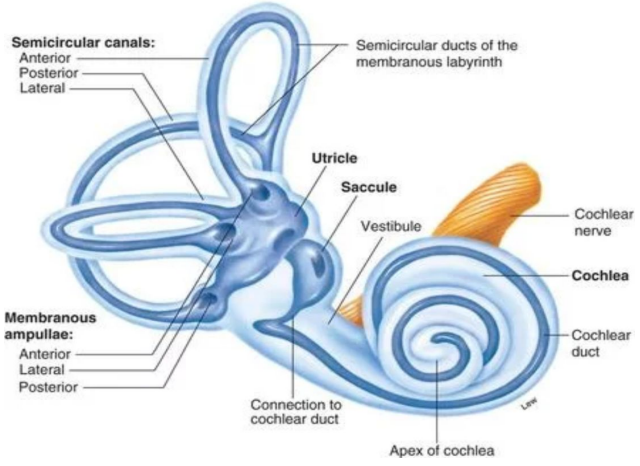


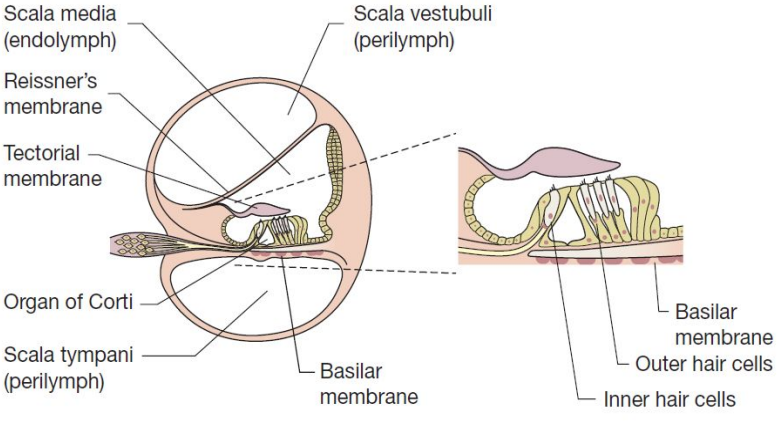
❖ Physiology:

- The body's sense of equilibrium is maintained by input from a number of sources. These include the (**eyes**, **proprioceptive organs** especially in the muscles and joints of the neck, peripheral nerves, the **labyrinth** or 'balance organ' in the inner ear which includes the vestibule and semicircular canals and the **cerebral cortex** and **cerebellum**).
- Input from all these sources converges in the brain stem; dysfunction of any of these systems may lead to imbalance, a feeling of unsteadiness, 'vertigo' – a sensation of movement – and a tendency to fall.
- Vertigo may be accompanied by 'nystagmus' – a rapid beating of the eyes to one side as impulses from the brainstem to the ocular muscles attempt to correct the patient's balance.

- **Vestibular System**: It is the apparatus of the inner ear that provides stable vision during head movements. It transforms the forces associated with head acceleration and gravity into biological signals that the brain can use to develop:

    - Subjective awareness of head position in space (**orientation**).
    - Produce **motor reflexes** that will maintain posture and ocular stability keep the eye focused on the object of interest.
    - Semi-circular Canals **Angular** Acceleration.
    - Utricle & Saccule:
        - Macule of the utricle : plan horizontal.
        - Macule of the saccule: plan vertical.
        - **Linear** acceleration horizontal & Vertical (gravity).





❖ Definitions:

- The word "vertigo" comes from the Latin "vertere", to turn + the suffix "-igo", a condition = a condition of turning about.
- It is an allusion of being moving or the world is moving too.
- **Instability** : impossibility to maintain one's body in desire position. (كأنك فوق سفينة) and could be caused by low BP and low blood sugar.
- **Nystagmus** : Is an involuntary conjugated rapid repetitive eye movement.

1. Side to side (horizontal).
2. Up and down (vertical).
3. In a circle (torsional/rotatory).

❖ History:

- The diagnosis of the cause of vertigo or imbalance depends **mostly on history**, much on examination and little on investigation.
- Patients will use various terms to describe their imbalance including 'dizziness', 'vertigo', 'funny turns' and giddiness'.
- Pay particular attention to timing, i.e. are the symptoms:
    - Constant or episodic.
    - Short lived as in the **few minutes** of dizziness associated with **benign positional vertigo**.
    - Last for a **few hours** as in **Menière's disease**.
    - Are there associated ear symptoms:
        - deafness, tinnitus, earache or discharge, and are there neurological features (loss of consciousness, weakness, numbness, dysarthria and diplopia, or seizures).
    - Note the past medical history and make a record of the patient's medications (ototoxic drug intake: gentamicin and other aminoglycoside antibiotics).
- **What are the questions to ask in history?**
    - Frequency: Recurrent, Non -Recurrent.
    - Duration: Seconds, Minutes, Hours to days.
    - Associated auditory symptoms: Tinnitus, Deafness, Fullness (المريض يقولك حاس إن أذني مليانة).
    - Aggravating and relieving factors: Rolling over in bed, Getting up from bed, Looking up, Consume salty food.
    - Ear disease or ear surgery.
    - Trauma.
    - Migraine.

❖ Examination:

- BP (HTN), Pulse, Eye movement (nystagmus)
- **Hearing test**: Tone Audiogram, Speech Audiogram, examining the CN.8.
- **Balance test**: Romberg, finger to nose test, unterberger test.

❖ Investigation:

- **CT:** Skull Fracture ?
- **MRI:** Of brain, Tumor?
- Duplex.
- VNG.
- Audiogram.
- Head impulse test.
- v-HIT.

Symptoms	Peripheral	Central
Imbalance	Moderate-severe	Mild-moderate
Nausea and vomiting	Severe	Variable
Auditory symptoms	Common	Rare
Neurologic symptoms	Rare	Common
Compensation	Rapid	Slow
Nystagmus	Unidirectional Horizontal or rotatory	Bidirectional Horizontal or vertical

Table 14.1 Guide to causes of vertigo

Episodic with ear symptoms
- Migraine
- Menie`re's disease

Episodic without ear symptoms
- Migraine
- Benign paroxysmal positional vertigo
- Transient ischaemic attacks
- Epilepsy
- Cardiac dysrhythmia
- Postural hypotension
- Cervical spondylosis

Constant with ear symptoms
- Chronic otitis media with labyrinthine fistula
- Ototoxicity
- Acoustic neuroma

Constant without aural symptoms
- Multiple sclerosis
- Intracranial tumour
- Cardiovascular disease
- Degenerative disorder of the vestibular labyrinth
- Hyperventilation
- Alcoholism

Solitary acute attack with ear symptoms
- Viral infection, e.g. mumps, herpes zoster
- Vascular occlusion
- Labyrinthine fistula
- Round-window membrane rupture/head injury

Solitary acute attack without aural symptoms
- Acute labyrinthitis
- Vasovagal faint
- Vestibular neuronitis
- Trauma

Peripheral Vestibular loss:

❖ Vestibular neuritis: (inflammation)

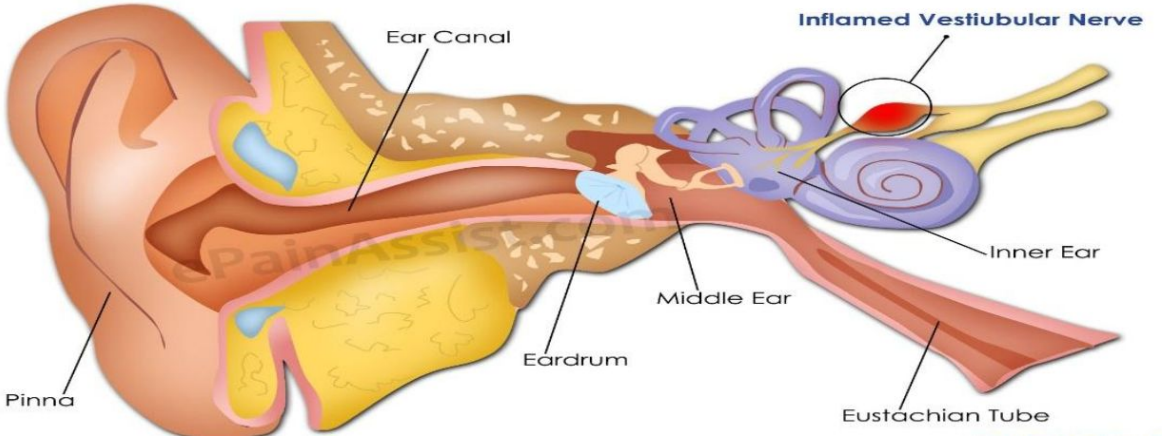
- Mostly preceded by Viral infection of vestibular organ (Measles, mumps, herpes zoster) Or URTI.
- Affect all ages but rare in children.
- Affected patient presents acutely with:
  - Spontaneous nystagmus.
  - Vertigo and nausea & vomiting.
  - Imbalance **WITHOUT** hearing loss that resolves over days leaving the residual imbalance that last days to weeks.
- It takes 3 weeks to recover from vestibular neuritis.

Clinical Features:

- **Acute phase:** severe vertigo (vertigo could turn into instability) with nausea, vomiting, and imbalance lasting 1 to 5 d, Irritative nystagmus (fast phase towards the offending ear) Patient tends to veer towards affected side.
- **Convalescent phase:** imbalance and motion sickness lasting days to weeks, Spontaneous nystagmus away from affected side, gradual vestibular adaptation requires weeks to months.

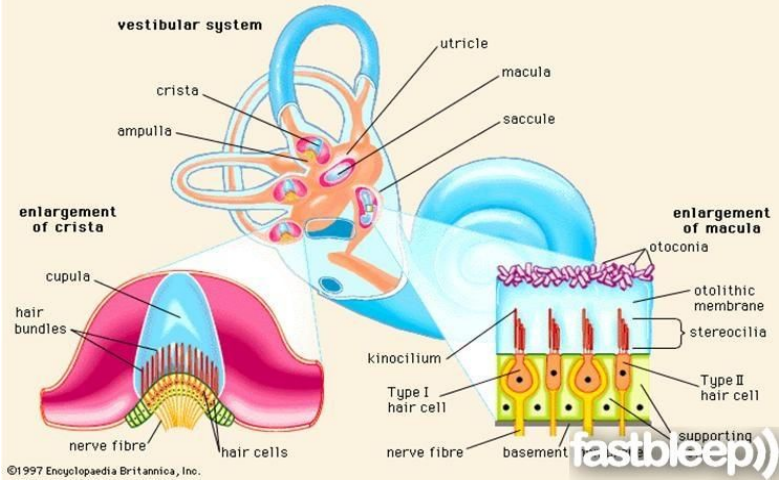
Treatment:

- The patient requires only symptomatic treatment:
  - **Acute phase:** bed rest, vestibular sedatives (Gravol®), and diazepam.
  - **Convalescent phase:** progressive ambulation especially in the elderly, vestibular exercise: (involve eye and head movements, sitting, standing, and walking).



❖ BPPV (benign paroxysmal positional vertigo):

- **Etiology:**
  - Due to canalithiasis (migration of free floating otoliths within the endolymph of the semicircular canal) or cupulolithiasis (otolith attached to the cupula of the semicircular canal) can affect each of the 3 semicircular canals, although the posterior canal is affected in >90%.
- The most common cause of vertigo in patient > 40 years.
- may occur spontaneously or following head injury. It is also seen in chronic otitis media.
- Steady resolution of BPPV is to be expected over a period of weeks or months. It may be recurrent.



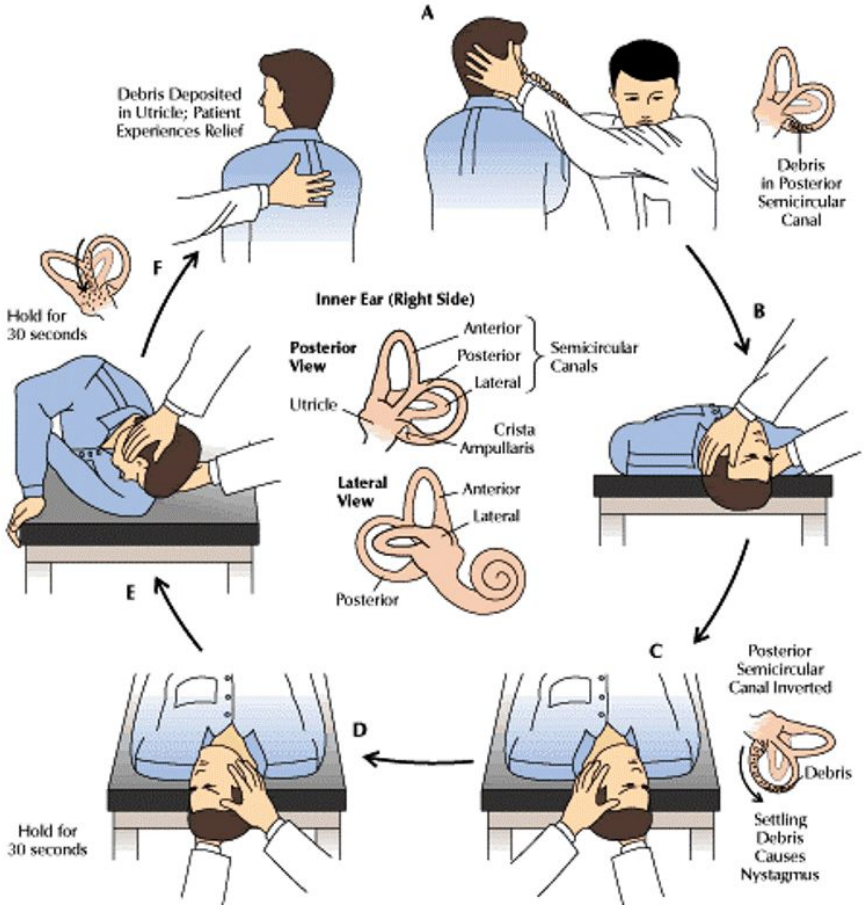
Diagnosis:

- **History:**
  - Repeated attacks of vertigo usually of short duration less than a minute.
  - Provoked by certain positions (rolling in beds, looking up, and head rotations).
  - A sensation that the head is 'spinning' occurs following a latent period of several seconds. This is thought to be due to a degenerative condition of the utricle of the inner ear which causes calcified particles to shear off the highly specialized neuro-epithelium.
  - Not associated with any hearing impairment.
- **Examination:**
  - Dix-Hallpike maneuver (Video), Signs of BPPV Seen with DixHallpike Maneuver:
    - Geotropic rotatory nystagmus (**nystagmus MUST be present for a positive test**).
    - Fatigues with repeated maneuver and fixation.
    - Reversal of nystagmus upon sitting up.
    - Latency of ~20 s • Crescendo/decrescendo vertigo lasting 20 s.
  - Nystagmus will be seen but repeated testing results in abolition (canceling) of the vertigo.

Treatment:

- Anti-emetics for nausea/vomiting.
- Particle repositioning maneuvers: **Epley maneuver**: (Performed by MD) which is said to work by dislodging calcified particles ('otoliths') within the inner ear fluids.
- Brandt-Daroff exercises (performed by patient).
- Surgery for refractory cases.

Dix-Hallpike maneuver

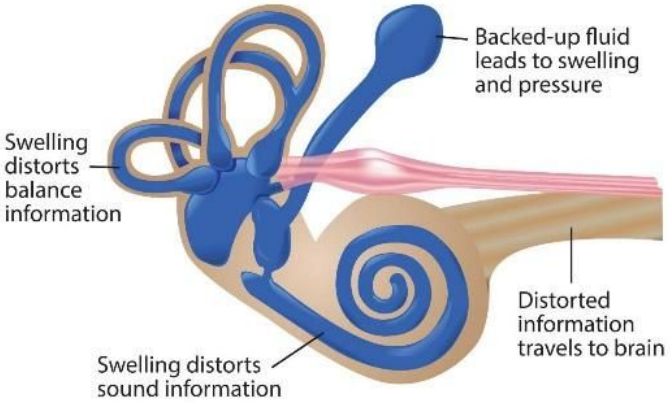


❖ Endolymphatic hydrop (Meniere's disease):

- Pathophysiology: Unknown etiology, but interest has focused on ↑ production of fluid within inner compartment or inadequate absorption of endolymph leads to endolymphatic hydrops.
- Menière's disease is fortunately uncommon, but may be incapacitating.
- In 10 - 20% of cases the disease later involves the opposite ear .
- It can occur at any age, but its onset is most common between 40 and 60 years.
- It usually starts in one ear, but the second becomes affected in 25% of cases.

Diagnosis:

- **History:**
  - There is a typical triad of symptoms of **vertigo** (minutes to hours), **deafness** (**Low frequency** - Although deafness is **fluctuant** repeated attacks can cause significant sensorineural hearing loss) and **tinnitus** (tinnitus may be constant but is more severe before an attack).
  - The attacks can last from a few hours to several days.
  - Vomiting is common during attacks.
  - Triggers: High salt intake, caffeine, stress, nicotine and alcohol.
  - Fullness of the ear "pressure".
- PTA (pure tone audiometry).
- Must monitor the other ear as bilaterally occur in 35% of cases, so the diagnostic criteria for Meniere's Disease (must have all three):
  - Two spontaneous episodes of rotational vertigo ≥20 minutes.
  - Audiometric confirmation of SNHL (often low frequency).
  - Tinnitus and/or aural fullness.



Treatment:

- Anti-emetics and labyrinthine sedatives are helpful in an acute attack, but if the patient is vomiting oral medication is of limited value. "This information wew taken from the book not slides"
- Decrease intake of **CATS** (Chocolate, Alcohol, Tea, Salt).
- Medical therapy.
- Meniett device's
- Chemical perfusion.
- Surgery.

Central vestibular loss: wasn't mentioned in lectures.

1- CVA:

Elderly patient with chronic disease like (DM, HTN) with sudden attack of vertigo +neurological symptoms.

2- Acoustic neuroma:

Benign tumor.

Arise from vestibular division of VIII.

Pathogenesis:

- Starts in the internal auditory canal and expands into cerebellopontine angle (CPA), compressing cerebellum and brainstem
- When associated with type 2 neurofibromatosis (NF2): bilateral acoustic neuromas, café-au-lait skin lesions, and multiple intracranial lesions

Clinical presentation:

- Unilateral tinnitus
- Hearing loss
- Dizziness But true vertigo is rare as tumor growth slowly thus compensation occurs.
- Facial nerve palsy and trigeminal (V1) sensory deficit (corneal reflex) are late complication.

DDx: Acoustic neuroma mimics Meniere's disease in presentation and imaging is the only way to differentiate between them.

Diagnosis:

- History
- PTA (Unilateral SNHL)
- Radiology (CT, MRI)
- MRI with Gadolinium contrast is the gold standard.

Treatment:

- Expectant management if tumor is very small, or in elderly. Definitive management is surgical excision.