

430 Teams

# Diseases of the Ear, Nose and Throat



19th Lecture:

## Vertigo

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Sources: Dr. Hagr's lecture, 429 ENT Team Notes (Vertigo).

Important Notes in **red**

Copied slides in **black**

Your notes in **green/ blue**

Titles and subtitles in this color

Highlight possible MCQs mentioned or pointed by the doctor

## INTRODUCTION:

What are the components of balance system?

### 1. Inner ear (5)

- 3 semicircular canals: one lateral one vertical one posterior (Why? Any movement can be detected through them) Rotational
- Otolith organs: control back and forth and side-to-side movement (Translational)

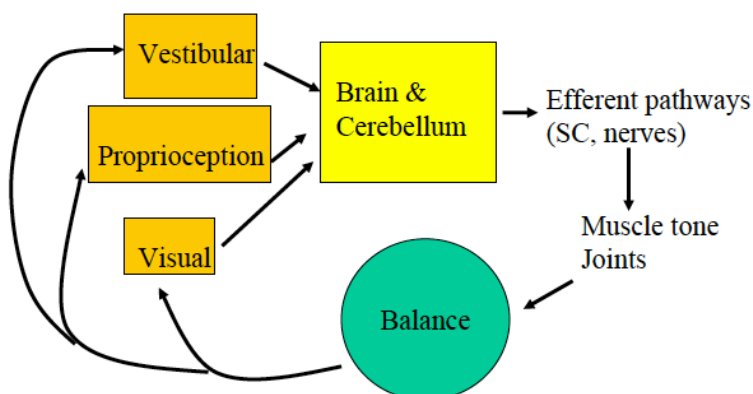
### 2. Cerebellum

### 3. Vision

### 4. Proprioception

#### Basic Mechanism of Detection of Rotation

- **INERTIA:** Would resist any movement and this resistance picked up by the nerve delivered to the brain. This always happens at the firing level. Like any muscle that has a tone, there is a firing level in both sides of vestibular organ that balance themselves; if tone is firing the other one is lowering. i.e. they are balancing each other. This is always in the acceleration phase. Therefore, balance problems can be detected through acceleration and deceleration as movements in the car (Ups & Downs like الهمد).
- Detects head acceleration – but encodes head velocity (i.e. integrator)



#### How does the balance system work?

1. Transformation of the forces associate with head acceleration and gravity into biological signals that the brain can use to develop subjective awareness of head position in space (orientation)
2. Production of **motor reflexes** that will maintain posture and ocular stability
3. Any pathology will cause: imbalance, posture and gait imbalance & visual distortion (oscillopsia).

#### Why do we have a vestibulo ocular reflex?

1. Stabilizes retina in space – fast! On head movement
2. Posture Control (Do finger test)

#### What is dizziness? In general; ear causes vertigo NOT dizziness.

It is the illusion of movement of self or environment. It is a very vague term that could mean:

- True spinning (vertigo)
- Lightheadedness
- Unsteadiness
- Fainting/passing out

Due to cardiovascular, neurological, or inner ear disease

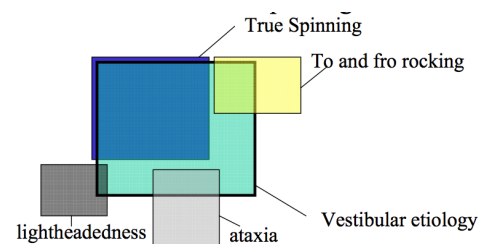
#### What is vertigo?

- It is the illusion of rotational, linear, or tilting movement of self or environment.
- Rule: "All true spinning is vestibular – not all vestibular is spinning"
- \*You have to think if it's central or peripheral; it is central in patients with neurological symptoms (headache, nystagmus, loss of consciousness, risk factors, atrial fibrillation...etc) → go to neurologist.
- \*Peripheral from the ear (more severe); nausea, vomiting, inability to walk, ataxic gait.

**Prime clue #1:** Is it vertigo (true spinning)? (Usually spinning worse w/movement + ataxia + nystagmus + nausea & vomiting)

#### History: (most importantly to ask about first and last episode)

- o Onset
- o Character: establish that it is true spinning not just dizziness from other cause
- o Duration



- o Frequency
- o Aggravating/relieving factors
- o Associated auditory symptoms
- o Hx of ear disease or ear surgery
- o Hx of trauma
- o Hx of migraine
- o Hx of ototoxic drug intake

• **Peripheral vs. central history:**

- o Neurologic symptoms e.g. new severe headache, loss of consciousness
- o Type of nystagmus
- o Risk factors (HTN, DM, Atrial fibrillation)
- o No improvement with 48 hours

**If Central → Neurologist**

**Symptoms usually are severe not like other disease regarding the nausea and vomiting, imbalance.**

Symptoms	Peripheral	Central
Imbalance	Mild- Moderate	Severe
Nausea and Vomiting	Severe	Variable
Auditory Symptoms	Common	Rare
Neurological Symptoms	Rare	Common
Compensation	Rapid	Slow
Nystagmus	UNI directional ( Horizontal or Rotatory )	Bi directional ( Horizontal or Vertical )

**Prime clue #2:** What is the duration of the attack? Is it seconds to minutes, minutes to hours, days or constant?

Vertigo	With Hearing Loss	Without Hearing Loss
Seconds-Minutes		BPPV
Minutes-Hours	Meniere's Disease	RV, MAV
Hours-Days	Labyrinthitis	Vestibular Neuritis

• **Can it be more than one type?** Yes

- o Example: vestibular neuritis followed by BPPV (**benign paroxysmal positional vertigo**).

o **Distinguish:** 1<sup>st</sup> episode vs. most recent episode

- o How **often**? How **long**? How is it **changing**?

• **Worrisome features:**

- o Diplopia, Dysarthria, Dysphagia, Difficulty moving 1 side/limb, paraesthesia 1 side/limb
- o **Bowel or bladder disturbance**
- o **True loss of consciousness**
- o **Prominent arrhythmia**

**if one of the above is present, go to a Neurologist. Not related to ENT.**

**Prime clue #2:** What is the duration of the attack? Is it seconds to minutes, minutes to hours, days or constant?

**PERIPHERAL CAUSES OF VERTIGO**

**1] BENIGN PAROXYSMAL POSITIONAL VERTIGO (BPPV)**

- **Definition:** Acute attacks of severe **transient vertigo lasting seconds** to minutes initiated by certain head positions accompanied by rotatory nystagmus (geotropic = fast phase towards the floor).
- The most common cause of **episodic** vertigo, and vertigo in patients > 40 years
- Multiple attacks per day with no hearing loss.
- Comes with nausea and vomiting

• **Etiology:**

- o **Not identifiable**
- o Closed head injury followed (surgery)

- o Infections (15% vestibular neuritis)
- o Prolonged bed rest
- o Ménière's disease
- o Recurrent vestibulopathy
- o Migraine

### • Pathophysiology:

- o Canalithiasis: degenerative debris from utricle (otoconia) floating freely in the endolymph
- o Posterior canal hangs down like the water trap in a drainpipe, allowing the crystals to settle in the bottom of the canal.

### • History:

1. Onset: sudden
2. **Duration: seconds-minutes**
3. Frequency: bouts of vertigo then remissions
4. Severe vertigo

Accompanied by nausea and vomiting, Disease affecting the inner ear, multiple attack per day, short duration, disease of the young.

### 5. Associations with changes in head position

- Rolling over or getting into bed
- Assuming a supine position
- Arising from a bending position
- Looking up to take an object off a shelf
- Tilting the head back to shave

6. Worse on awakening in the morning
7. Chronic balance problems

\*Pathognomonic: distinctively characteristic of a particular disease or condition

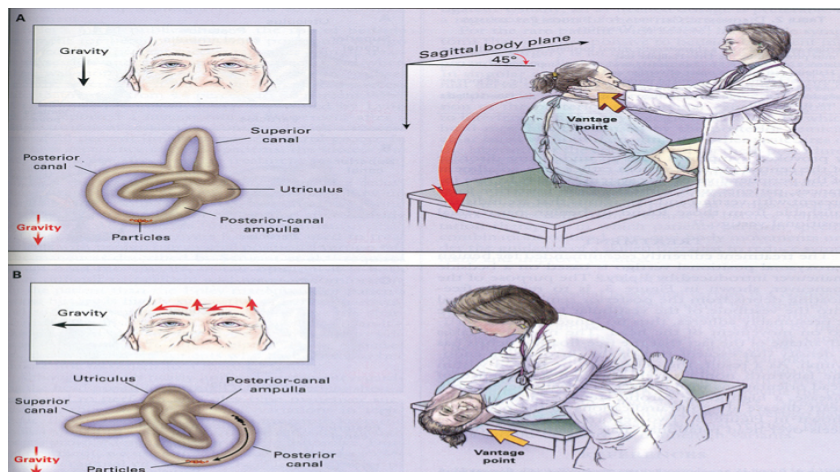
### • Clinical approach (diagnosis):

History is virtually pathognomonic. It is the only type of vertigo:

- Multiple times per day
- Brief episodes
- **Unaccompanied by auditory complaints**

o **Dix-Hallpike maneuver:** diagnostic test to identify BPPV

- Maneuver: patient in sitting position w/legs extended → head is rotated 45° → lie down backwards quickly with head in 20° of extension → return to sitting position
- Positive test: nystagmus **MUST** be present = "Hagr's 6 D's"
  - Delay of ~20 seconds
  - Downward (geotropic) rotatory nystagmus
  - Duration <1 minute
  - Directional change (upon sitting up – direction reverses)
  - Dizziness (subjective)
  - Disappearance (fatigable: less vertigo each time test is repeated)



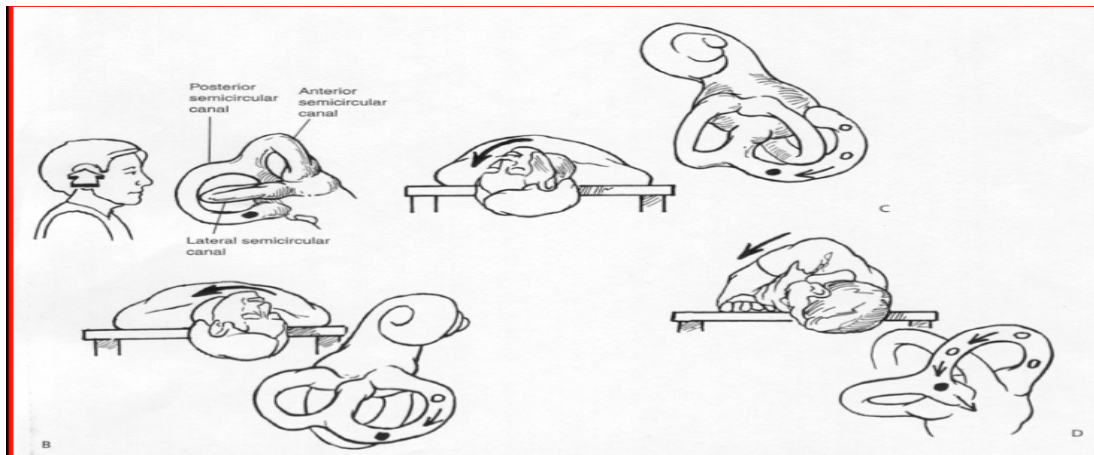


- **Differential diagnosis**

- o Postural hypotension (Hx of antihypertensive drugs, cardiovascular disease...etc)
- o Perilymph fistula

- **Treatment:**

- o Reassure patient that process resolves spontaneously
- o Particle repositioning maneuvers **Epley's maneuver** (performed by MD)



- Brandt-Daroff exercises (performed by patient)

- o Surgery for refractory cases
- o Anti-emetics for nausea/vomiting
- o Drugs to suppress the vestibular system delay eventual recovery and are not used

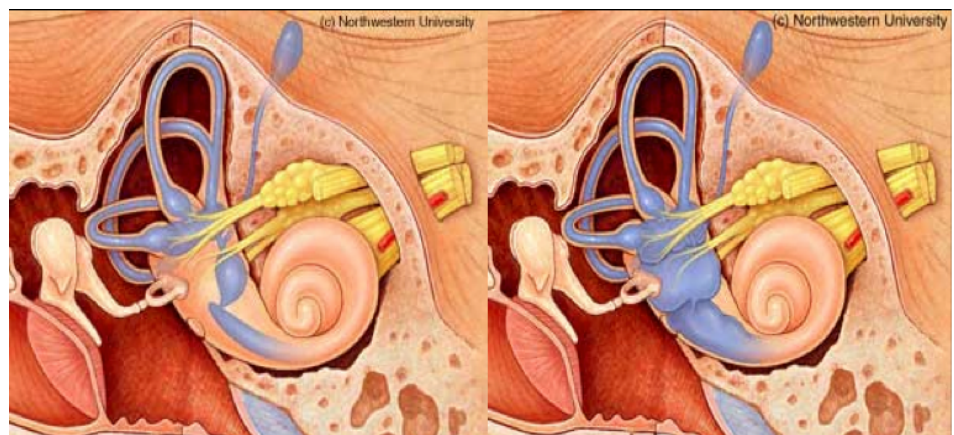
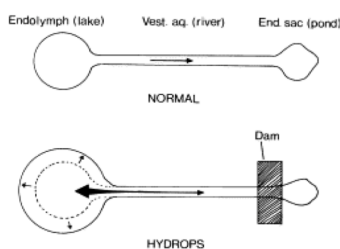
## 2] MENIERE'S DISEASE The worst disease patients could have in their life.

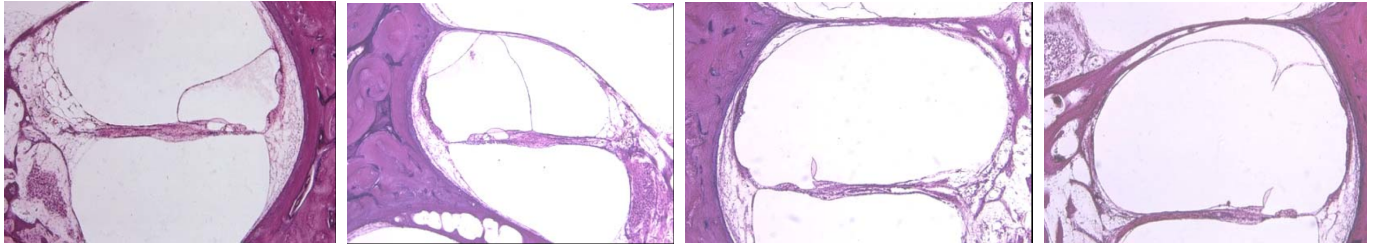
• **Definition:** episodic attacks of vertigo, **tinnitus**, **hearing loss**, and aural fullness lasting minutes to **Hours**

Sever vertigo lasting for hours with nausea and vomiting. The patient is usually very depressed. The doctor said the attacks are like epileptic attacks but the patients are awake which affect their psychological status. 4-5 attack for half hour to an hour.

• **Pathology:** Unknown, this what they think might be due to:

1. **Decreased** endolymphatic **reabsorption**
2. Progressive **hydrops**
3. Membranous **ruptures**
4. Spillage of large amounts of **neurotoxic endolymph** into the perilymphatic compartment
5. **Healing** of the membranes
6. **Distortion and atrophy** of sensory and neural structures





• **Causes:** Overproduction or retention of endolymph (Pressure building up in the inner ear) Stress, fasting, could precipitate an attack. Relaxing could prevent or at least help.

1. **Unknown**

2. Autoimmune
3. Ischemia
4. Mumps
5. Syphilis
6. Hypothyroidism
7. Head trauma
8. Previous infection
9. Hormonal (Pregnant females are more prone)

• **Course:**

1. Early
  - a. **Predominant Vertigo**
  - b. Deafness
  - c. Normal hearing between the attacks
2. Later
  - a. **Hearing loss stops fluctuating**
  - b. **Progressively worse (50db)**

• **Diagnosis:**

1. History & physical (**unilateral**)
2. Pure Tone Audiometry = **low frequency SNHL**
3. By exclusion: R/o other DDx

• **Treatment:**

1. **Acute attacks:**

- a. Prevent falls (bed rest)
- b. Head should be restricted
- c. Anticholinergics
- d. Antihistamines (Serc®)
- e. Phenothiazine
- f. Benzodiazepines

2. **Long-term**

- a. Medical
  - Low salt diet, diuretics (e.g. hydrochlorothiazide, triamterene, amiloride)
  - **Local application of gentamicin (poisonous) to destroy vestibular end-organ, results in complete SNHL**
  - Serc® (betahistine; anti-H<sub>1</sub>) prophylactically to ↓ intensity of attacks
- b. Surgical: elective vestibular neurectomy or transtympanic labyrinthectomy
- c. Follow-up: must monitor opposite ear. Disease is bilateral in 35% of cases.

GOALS

1. Education
2. To **treat** the acute attacks
3. To **prevent** further attacks
4. To **improve hearing**
5. **Vestibular rehabilitation**

### 3] VESTIBULAR NEURONITIS

• **Definition:** acute onset of disabling vertigo often accompanied by nausea, vomiting and imbalance **without hearing loss**, that resolves **over days**, leaving a **residual imbalance** that lasts days to weeks.

• **Etiology:**

- o **Viral infection of vestibular organ** (e.g. Measles, Mumps, Herpes Zoster)
- o In 50%, infectious

Ototoxic medication (gentamycin injections)

\*the doctor didn't mention this part.

- **Abrupt onset**
- Single, severe and prolonged episode
- **No hearing loss**
- No neurologic signs or symptoms
- **Nystagmus**

- Features:

1. Acute Phase:

- a. Severe vertigo with nausea, vomiting and imbalance lasting 1 to 5 days
- b. Irritative nystagmus (fast component towards the offending ear)
- c. Patient tends to veer towards affected side

2. Convalescent Phase:

- a. Imbalance and motion sickness lasting days
- b. Spontaneous nystagmus away from affected side

3. Recovery (within 3 weeks). Incomplete recovery likely with specific risk factors: e.g. elderly.

4. Repeated attacks can occur.

- Treatment: requires symptomatic treatment **ONLY**

- o **Acute phase:** bed-rest, vestibular sedatives (Gravol: antihistamine; anticholinergic, antiemetic, sedative), diazepam (benzodiazepine)

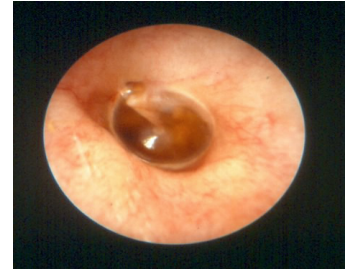
- o **Convalescent:** progressive ambulation, vestibular exercises (involves head & eye movement)

## OTOTOXICITY

- Usually due to aminoglycosides e.g. gentamicin
- Patients complain of oscillopsia (visual distortion)

## Investigations: For patient with vertigo

Audiology (PTA pure tone audiometry, ENG Electronystagmography, posturography, rotation chair), radiology (CT/MRI), blood tests (CBC, thyroid function tests (TFT), FT-Abs)



## Cases:

### Secretory Otitis Media (Glue Ear)

Fluid behind the eardrum

- 3 Y
- Recurrent OM
- Hearing Loss

## Fracture Base of Skull

- Motor Vehicle Accident
- Left earache
- Hearing loss



## Otosclerosis vs Tympanosclerosis?

### Tympanosclerosis

- 33 y
- No hearing loss
- Ear exam ☐



### Cochlear implant

- What is this?
- Hearing aid (Cochlear implant)
- which type of hearing loss?
- Sensory neural hearing loss.



15 years old girl

- What is this?
- B.A.H.A
- Which type of hearing loss?
- For conductive hearing loss.



\*429 notes doctor didn't mention\*

### CINICAL SCENARIOS

#### 1. The patient who is having his first attack ever of acute spontaneous vertigo:

- DDx: Acute vestibular neuritis or cerebellar infarction
- How to differentiate?
  - Clinically (General appearance of patient /nystagmus/head impulse test)
  - Radiology
- Note that: chronic and recurrent (BPPV)

#### 2. The patient who has repeated attacks of vertigo, but is seen while well

- Recurrent spontaneous vertigo
  - Menière's disease
  - Migraine induced vertigo
  - Perilymph fistula
- Recurrent positional vertigo
  - BPPV

#### 3. The patient who is off-balance

- Bilateral vestibulopathy
- Normal pressure hydrocephalus (triad of ataxic gait, urinary incontinence and dementia)
- Posterior fossa tumor

- Differential diagnosis (according to Hx)



Condition	Duration	Hearing Loss	Tinnitus	Aural Fullness	Other Features
BPPV	Seconds	-	-	-	-
Meniere's Disease	Minutes to Hours	Uni/Bi lateral Fluctuating	+	Pressure/ Warmth	-
Vestibular Neuronitis	Hours to Days	Unilateral	-	-	-
Labyrinthitis	Days	Unilateral	Whistling	-	Recent AOM
Acoustic Neuroma	Chronic	Progressive	+	-	Ataxia CN VII Palsy