Vertigo

429 ENT Team (F_2)

Sources: Dr. Hagr's lecture, 429 ENT Team Notes (Vertigo), Toronto Notes 2011. **NOTE**: physiology part was not discussed extensively - irrelevant to exam material.

By: Roa Alsajjan

INRODUCTION

What are the components of balance system?

1. Inner ear
    a. 3 semicicular canals: one lateral one vertical one posterior (Why? Any movement can be detected through them)
    b. Otolith organs: control back and forth and side to side movement
2. Cerebellum
3. Vision
4. Proprioception

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).

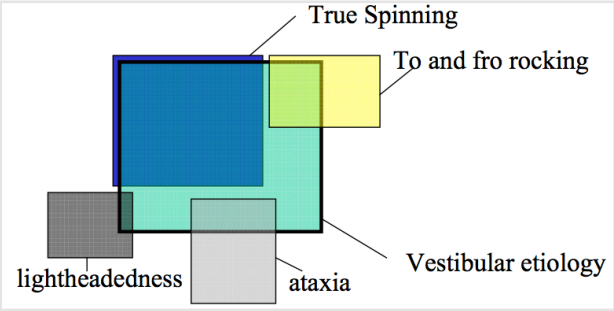
What is dizziness?

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"



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

- **History:**
    - Onset
    - Character: establish that it is true spinning not just dizziness from other cause
    - Duration
    - Frequency
    - Aggravating/relieving factors
    - Associated auditory symptoms
    - Hx of ear disease or ear surgery
    - Hx of trauma
    - Hx of migraine
    - Hx of ototoxic drug intake

- **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

- **Peripheral vs. central history:**
  - Neurologic symptoms e.g. new severe headache, loss of consciousness
  - Type of nystagmus
  - Risk factors
  - No improvement with 48 hours

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?

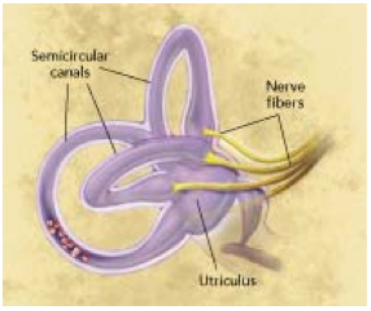
Vertigo	With Hearing Loss	Without Hearing Loss
Seconds-Minutes		BPPV
Minutes-Hours	Meniere's Disease	RV, MAV
Hours-Days	Labyrinthinitis	Vestibular Neuritis

- **Can it be more than one type?** Yes
  - Example: vestibular neuritis followed by BPPV
  - Distinguish: 1st episode vs. most recent episode
  - How **often**? How **long**? How **changing**?
- **Worrisome features:**
  - Diplopia, Dysarthria, Dysphagia, Difficulty moving 1 side/limb, paraesthesia 1 side/limb
  - Bowel or bladder disturbance
  - True loss of consciousness
  - Prominent arrhythmia

PERIPHERAL CAUSES OF VERTIGO

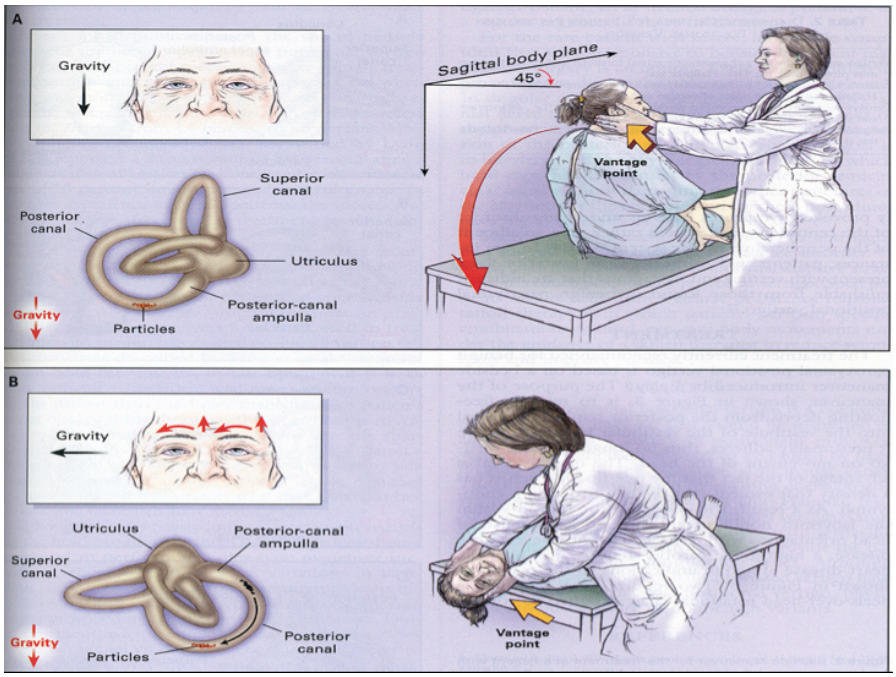
1] BENIGN PAROXYSMAL POSITIONAL VERTIGO

- **Definition**: Acute attacks of **transient** vertigo lasting seconds to minutes initiated by certain head positions accompianed by rotatory nystagmus (geotropic = fast phase towards the floor)
- The most common cause of episodic vertigo, and vertigo in patients > 40 years
- **Etiology**:
  - **Not identifiable**
  - Closed head injury followed (surgery)
  - Infections (15% vestibular neuronitis)
  - Prolonged bed rest
  - Ménière's disease
  - Recurrent vestibulopathy
  - Migraine

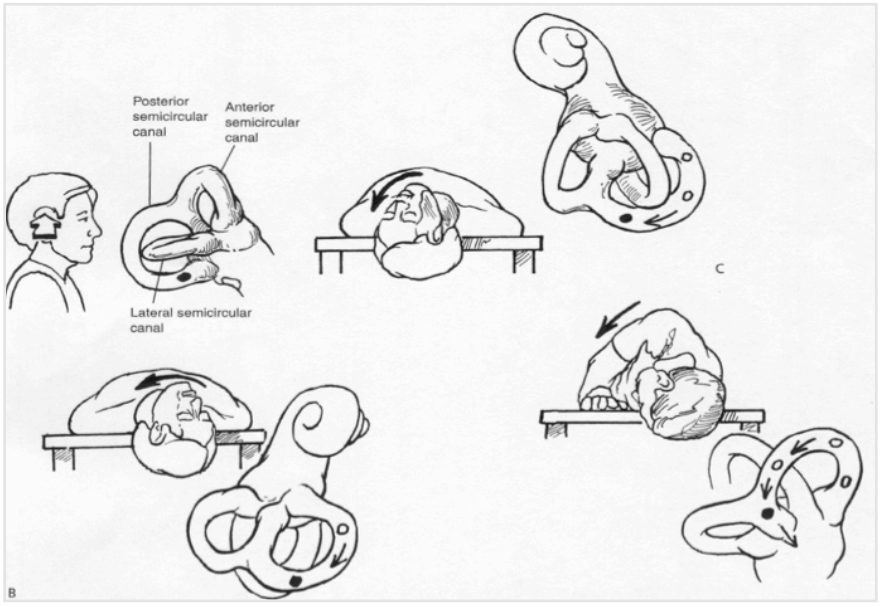


- **Pathophysiology**:
  - Canalithiasis: gegenerative debris from utricle (otoconia) floating freely in the endolymph
  - Posterior canal hangs down like the water trap in a drainpipe, allowing the crystals to settle in the bottom of the canal.

- **History:**
  1. Onset: sudden
  2. Duration: seconds-minutes
  3. Frequency: bouts of vertigo then remissions
  4. Severe vertigo
  5. **Associated with change 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
- **Clinical approach (diagnosis):**
  - History is virtually pathognomonic. Only type of vertigo:
    - Multiple times per day
    - Brief episodes
    - Unaccompanied by auditory complaints
  - Dix-Hallpike maneuver: diagnostic test to identify BPPV
    - Meneuver: 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)



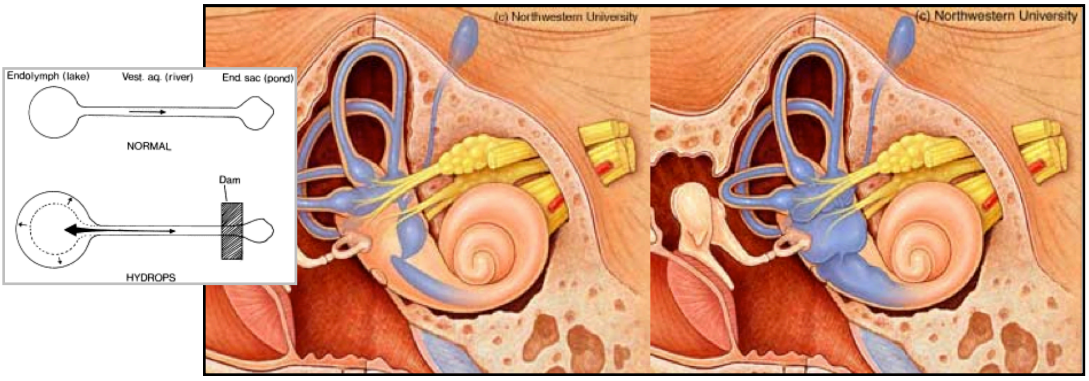
- **Differential diagnosis**
  - Postural hypotension (Hx of antihypertensive drugs, cardiovascular disease, etc)
  - Perilymph fistula
- **Treatment**:
  - Reassure patient that process resolves spontaneously
  - Particle repositioning maneuvers
    - Epley maneuver (performed by MD)

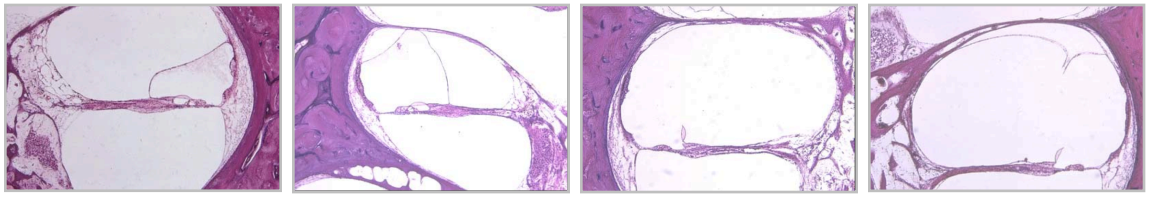


    - Brandt-Daroff exercises (performed by patient)
  - Surgery for refractory cases
  - Anti-emetics for nausea/vomiting
  - Drugs to suppress the vestibular system delay eventual recovery and are not used

2] MENIERE'S DISEASE

- **Definition**: episodic attacks of vertigo, tinnitus, hearing loss, and aural fullness lasting min-hrs
- **Pathology**:
  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
  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
  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:

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

    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 to destroy vestibular end-organ, results in complete SNHL
            - Serc® (betahistine; anti-H_1) 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.

3] VESTIBULAR NEURONITIS

- Definition: acute onset of disabling vertigo often accompanied by nausea, vomiting and imbalance without without hearing loss, that resolves **over days, leaving a residual imbalance** that lasts days to weeks.
- Etiology:
    - Viral infection of vestibular organ (e.g. Measles, Mumps, Herpes Zoster)
    - In 50%, infectious

• 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. Irritaitive 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 the following risk factors: elderly.
    4. Repeated attacks can occur
- Treatment: requires symptomatic treatment **ONLY**
    - Acute phase: bed-rest, vestibular sedatives (Gravol: antihistamine; anticholinergic, antiemetic, sedative), diazepam (benzodiazepine)
    - Convalescent: progressive ambulation, vestibular exercises (involves head & eye movement)

OTOTOXICITY

- Usually due to aminoglycosides e.g. gentamicin
- Patients complain of oscillopsia (visual distortion)
- Dx: Audiology (PTA, ENG, posturography, rotation chair), radiology (CT/MRI), blood tests (CBC, thyroid function tests (TFT), FT-Abs)

CENTRAL CAUSES OF VERTIGO

1. Cerebrovascular accident: Elderly patient with chronic disease like (DM, HTN) with sudden attack of vertigo and **neurological symptoms**
2. Acoustic neuroma:
    a. Definition:
        i. Schwannoma of the vestibular portion of CN VIII
        ii. Benign tumor
    b. Pathogenesis:
        i. Starts in the internal audoitry canal and expands into cerebellar pontine angle CPA, compresses cerebellum and brain stem
    c. Clinical features:
        i. Unilateral SNHL or tinnitus
        ii. Dizzines; true vertigo is rare because the tumor growth is slow
        iii. Facial nerve palsy and trigeminal V1 (ophthalmic division)
        iv. Hearing loss
    d. Diagnosis:
        i. MRI with Gadolinium is the gold standard
        ii. Audiogram: SNHL
        iii. ABR: increase in the latency of the 5^{th} wave
    e. Treatment: Definitive is surgical excision
3. Multiple sclerosis

CLINICAL SCENARIOS

1. The patient who is having a first ever attack of acute spontaneous vertigo:
    a. DDx: Acute vestibular neuritis or cerebellar infarction
    b. How to differentiate?
        i. Clinically (General appearance of patient /nystagmus/head impulse test)
        ii. Radiology
    c. Note that: chronic and recurrent (BPPV)
2. The patient who has repeated attacks of vertigo, but is seen while well
    a. Recurrent spontaneous vertigo
        i. Menière's disease
        ii. Migraine induced vertigo
        iii. Perilymph fistula
    b. Recurrent positional vertigo
        i. BPPV
3. The patient who is off-balance
    a. Bilateral vestibulopathy
    b. Normal pressure hydrocephalus (triad of ataxic gait, urinary incontinence and dementia)
    c. Posterior fossa tumor