

MSS

Musculoskeletal System

P B L

Problem Based Learning

Doctor 2018 | Medicine | JU

Done by

Dana Alnasra ❤️

Contributed In The Scientific Correction

لينا عبد الهادي

Contributed In The Grammatical Correction

...

Doctor

Lubna khreesha

What's up, Doc? Hope you're doing well. I'll try to make this sheet as fun as possible so please bear with me.

⚠ For exam purposes, you only need to study the blue highlighted material + the pictures, the rest is only for clarification.

We've all felt dizzy some time or another, dizziness is simply disturbance of balance that may take different forms.

➤ **Balance:** a constant process of position detection, feedback and adjustment using communication between the inner ear, eyes, skeletal muscles, joints and the brain.

****Remember:** the inner ear has the cochlea – responsible for hearing, the vestibule and semicircular canals – responsible for **balance**. While the skeletal muscles have proprioceptors to detect position.

So, by seeing our position and detecting it by our inner ear and skeletal muscles (input), we (process) this information by the brain which sends out signals (output) to the body to move to achieve balance.

So, any damage to any of these will lead to balance disturbance.

Imagine:

You ditched the last PBL lecture and you're jogging alongside the seashore -yeah, as if. Your body is moving up and down, you know when your feet are going to hit the ground (you don't keep looking down and calculate the time), so that's the job of skeletal muscles proprioceptors. Your eyes are focused forward on that sailing ship, they're not jumping up and down with you (this means you're in balance). Suddenly, out of nowhere you decided to spin around in full speed, and you got dizzy, seeing the world spinning around you. What happened is that the fluid inside your inner ear got overstimulated which led to you losing your **balance**, and so, you don't have a steady gait or able to focus on that ship anymore. (please relate all this information to what we said above).

➤ **Types of dizziness:**



1. **Vertigo**: a feeling of spinning (illusional), mostly related to a **vestibular problem**.
2. **Disequilibrium**: feeling not in control of your body, or you're gonna fall at any time.
3. **Light-headedness**: feeling as if your head is empty, mostly **cardiovascular issues**
4. **Presyncope**: feeling like you will faint. Mostly **central issues**. (lesion in the brain or decreased blood supply to the brain).

Vertigo: a false sense of motion. (feeling yourself or your environment is spinning).

➤ **Causes of vertigo:**

1. **Peripheral (benign):** (from the most to least common)

- **BPPV**: benign paroxysmal positional vertigo → most common (can occur many times through lifetime)
- **Vestibular neuritis**: inflammation in the vestibular nerve. (once in a lifetime)
- **Menier's disease**, causes hearing and balance disorders.
- You can see the rest in the slides but they're not included.
note that otitis media is far down on the list, this is to show you that **vertigo complicated by otitis media is NOT common.

2. **Central (serious):** also from most to least common

- Migrainous vertigo
- Intracranial masses
- Stroke
- Vertebrobasilar insufficiency

➤ **Historical clues:** taking the patient's history is very important to reach your differential diagnosis. In the case of dizziness, it's focused history (short):

i. ask your patient these questions:

1. What do you mean by dizziness (type)? Is it a feeling of spinning, fainting, ...
2. For how long does the dizziness last?
3. Are there any recurrences?

This table shows that duration is important in the diagnosis. (focus on the circled ones)

| Time | Peripheral | Central |
|--------------|--|---|
| Seconds | BPPV | VB-TIA, aura of epilepsy |
| Minutes | perilymph fistula | VB-TIA, aura of migraine |
| (Half) hours | Menière disease | basilar migraine |
| Days | vestibular neuronitis labyrinthitis | VB stroke |
| Weeks, Month | acoustic neurinoma, drug toxicity | multiple sclerosis cerebellar degenerations |

- ii. look for the trigger: position changes, head movement, pressure changes, ...
- iii. Look for associated symptoms: neurological, hearing loss, tinnitus, headache.
- iv. Take past medical history: diabetes, head trauma, ...
- v. Family history: stroke, migraine, maniere's, BPPV
- vi. Medications: anti-hypertensives, anti-convulsants

****Examples:**

- If the trigger was positional changes, then it's most likely BPPV.
- The presence of neurological symptoms rules out peripheral causes of vertigo.
- Some medications have ototoxic side effects.

➤ **Physical examination:** (it's also focused)

- Ear: cerumen, vesicles on tympanic membrane, middle ear effusion, and hearing
- Eye: **nystagmus (uncontrolled movement)**, ocular movements, and vision
- Cardiovascular: carotid bruits, murmur, arrhythmia, signs of peripheral artery disease
- Neurologic: Romberg, cerebellar signs.

➔ History + physical examination will lead you to the diagnosis

➤ Now, for the fun part, **5 clinical cases:** note that they're all important and please pay attention to the history!!!

****Case1: a 67-year-old lady comes to your clinic saying:**

| Signs and symptoms/history | What you should think of |
|--|---|
| I feel like the room is spinning | vertigo |
| last only seconds | Seconds → have BPPV in mind |
| brought on by rolling over to get out of bed looking up to a shelf | the trigger factor: position changes |
| comes and goes | recurrence |
| no hearing loss or tinnitus | no neural/central involvement |
| feels fine between episodes | |
| Vitals: normal | Normal findings |
| Ear, nose, throat: some wax in canals | |
| Neurologic: normal, no nystagmus | |
| Neck: no carotid bruits | |
| Cardiovascular: no murmurs | |

Here, You don't have to know the details, only that the findings and other tests were normal

Now these are characteristics of BPPV

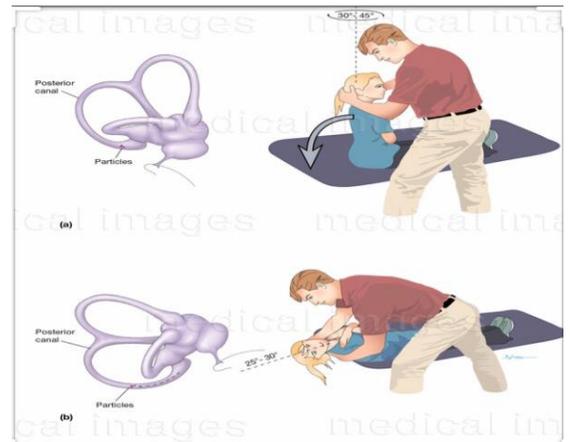
Benign paroxysmal positional vertigo (BPPV):

Why it happens? BPPV occurs when calcium carbonate crystals, which usually appear in the membranous labyrinth, move to one or more of the semicircular canals. So, when enough calcium carbonate crystals build up, they disrupt the movement of fluid through the semicircular canals, altering the signals that travel to the brain causing dizziness.

To confirm the **diagnosis**, we do a maneuver called the **DIX-HALLPIKE**, see the picture below.

By doing this maneuver we are stimulating the semicircular canals even more to see the nystagmus (uncountable eye movement).

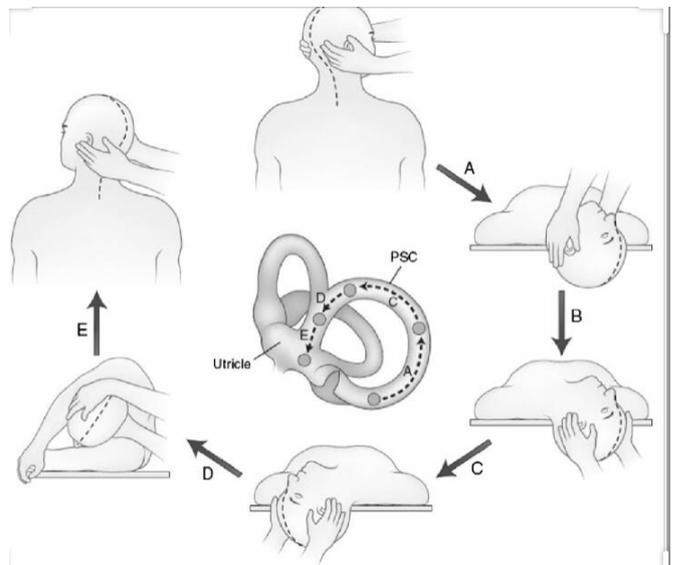
Ask your patient to sit on the exam table with his legs stretched out. turn his head 45 degrees to one side, then help him lie back quickly so his head hangs slightly over the edge of the table. This movement may make the loose crystals move within his semicircular canals. Ask him if he feels symptoms of vertigo and watch his eyes to see how they move.



Treatment: the best is **Epley maneuver**. This way you remove the stuck crystals out of the way and the dizziness disappears **without the need of medications.** (see picture)

success rate of doing this once is 85-90%, 10-15% will need to come back and do it again.

- Start by sitting on the edge of a bed.
- Turn the head 45 degrees to the right.
- Lie down on the back, keeping the head turned, then hold for 30 seconds.
- Turn the head so that it faces 45 degrees to the left, then hold for 30 seconds.
- Roll the body onto the left side, then hold for 30 seconds.
- Sit up on the left side.
- Repeat these steps on the other side, turning the head to the left first.



- In most cases, patients don't seek medical attention because usually it's self-limited within 4-6 weeks
- Physical therapy (vestibular rehabilitation) in resistant cases.
- Avoid symptomatic medications: meclizine, antiemetics, benzodiazepines.
- Counsel about recurrence, evaluate fall risk.

**Case2: a 45-year-old taxi driver who can't drive because of dizziness

Signs and symptoms/history: don't memorize these!! think logically

- Severe dizziness for 2 days
- Nausea and vomiting → Severe case
- Whenever he opens his eyes, he feels like everything is moving .
- Prefers to lie still with eyes closed
- Recent upper respiratory tract infection → Viral infection in the upper respiratory tract causing infection in the vestibular nerve → think of vestibular neuritis
- No hearing loss or tinnitus → which means the cochlear nerve is intact (not labyrinthitis).

Very important

Tests and examinations: everything is normal, only spontaneous nystagmus + unsteady gait

- Ear, nose, throat tests are normal
- Cardiovascular (CV): normal, no murmurs
- Neuro: spontaneous unilateral nystagmus to the right.
- Romberg normal (Romberg test is a test of skeletal muscles proprioception)
- Gait: veers towards the left but can walk

Vestibular neuritis: An inflammation of the vestibular nerve.

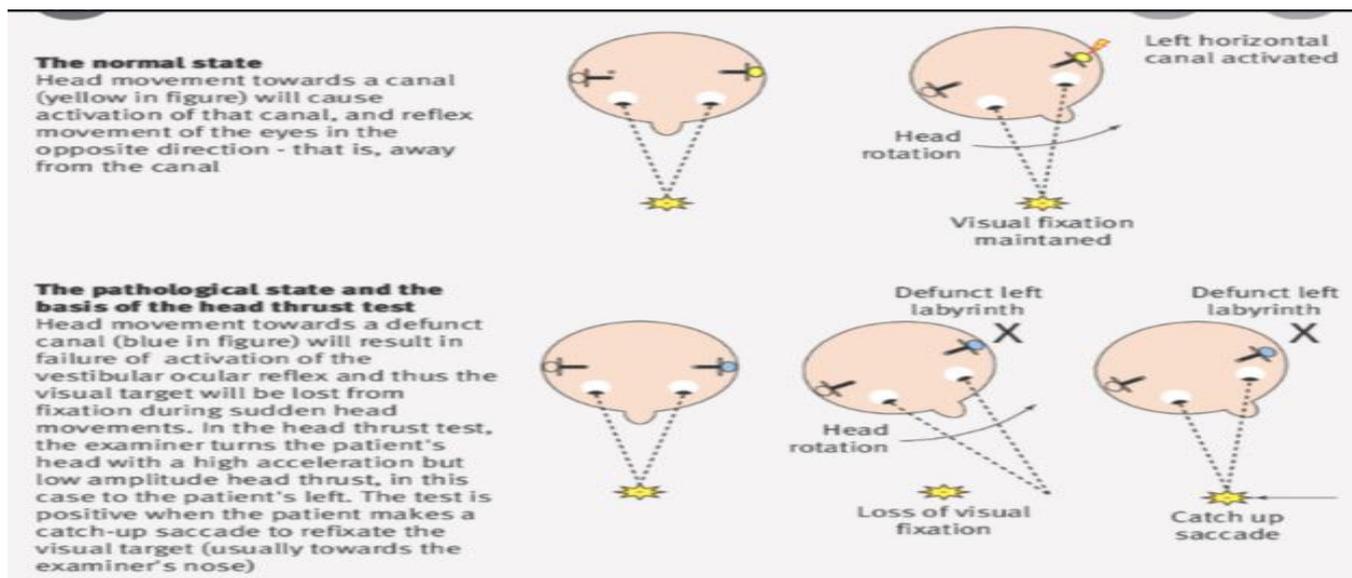
- It's the second most common cause of vertigo.
- 50% have had recent upper respiratory tract infection, hypothesized to be viral HSV of CNS.
- Sudden, constant severe vertigo
- Spontaneous nystagmus
- May veer towards the affected side.

To confirm the **diagnosis** and differentiate vestibular neuritis from cerebrovascular accident (stroke): we do the head thrust test and visual fixation.

The head thrust test:

the patient sits in front of the examiner and the examiner holds the patient's head steady in the midline. The patient is instructed to maintain gaze on the nose of the examiner. The examiner then quickly turns the patient's head about 10–15 degrees to one side and observes the ability of the patient to keep the eyes locked on the examiner's nose. If the patient's eyes stay locked on the examiner's nose, then the peripheral vestibular system is assumed to be intact. While in a patient with acute dizziness, the patient's eyes move

with the head and then the patient makes a voluntary eye movement back to the examiner's nose(catch up). → **this is a vestibular problem**



visual fixation:

Have the patient focus on a visual target. Observe nystagmus, if it stops eventually (fatigue) → **peripheral vertigo problem.**

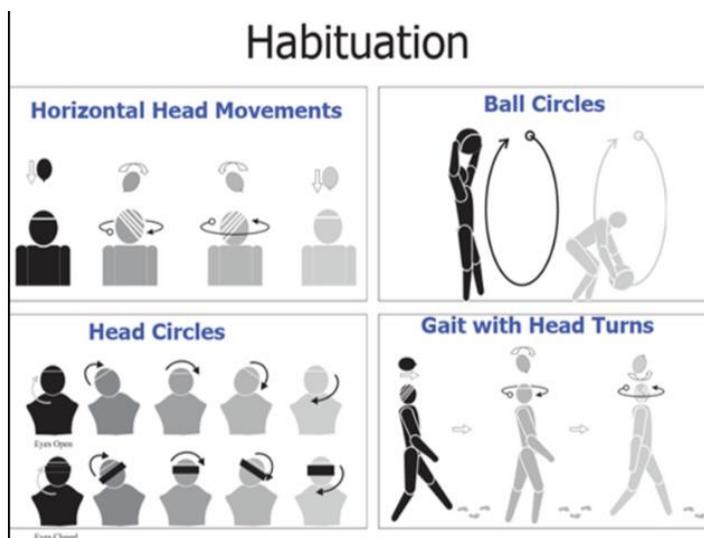
The nystagmus returns if you change the target, e.g. put a blank sheet of paper in front of his eyes.

If the nystagmus continues and doesn't stop → **central problem**

→ So now we know that this is a **peripheral vestibular** problem.

Treatment: this condition is usually severe and unbearable, so for the first few days ONLY, we give vestibular suppressors to relieve the severe vertigo. After that we give symptomatic treatment; antiemetics (for vomiting), antihistamines, diazepam (relaxants), and corticosteroids over 10 days to help subside the inflammation.

Due to the partial or complete damage to the nerve, there will be a difference in the balance between the right and left sides. And with time, the brain will try to adapt and compensate for this vestibular dysfunction, So the last step (best) in treatment is **vestibular rehabilitation (habituation)**; movements/exercises to help the brain compensate for the damage. (to facilitate recovery and decrease long-term sequel).



****Case3: a 13-year-old girl who is missing school due to dizziness episodes (dizzy spells):**

Signs, symptoms and history:

- Describes spinning sensation, often triggered by movement. Lasts hours, sometimes days. Associated with nausea, vomiting and photophobia. Seems to occur around time of menstruation.
- Previous medical history: chronic headaches
- Medications: NSAIDS as needed.
- Family history: migraines in mother, cerebrovascular attacks in grandmother (stroke)
- Physical examination: no abnormal findings including neurologic exam and gait.

→ Young age, triggered by stress, photophobia → Think of migraine

Here, the diagnosis is based on history and exclusion, because otherwise everything will look normal, even on MRI!!

Vestibular migraine: a special type of migraine, where a spasm followed by dilation of the artery supplying the brainstem causes a transient drop in the blood pressure. (vertebrobasilar artery).

- Common, unrecognized cause of vertigo
- Often a history of migraine
- Vertigo may occur with headache
- Duration and triggers similar to migraine
- Findings are normal → clinical diagnosis of exclusion
- Obtain audiometry and vestibular function testing to exclude other etiologies
- Consider brain MRI especially if there were stroke risk factors

Treatment: same as for migraine

- Improvement of vertigo with triptans (migraine drugs) can be both therapeutic and diagnostic
- Trigger avoidance → dietary changes, avoid chocolate and caffeine, regular exercise
- Prophylaxis if frequent or debilitating (once they feel they might get a migraine episode).

****Case4: a dizzy 37-year-old woman with an earful of ocean**

History/ signs and symptoms:

Last week had vertigo, nausea and vomiting. Lasted 3-4 hours, spontaneously resolved and recurred this morning. She has difficulty walking. Decreased hearing + tinnitus during the attack.

“sounds like the ocean is in my left ear” → a type tinnitus

Tests and examinations: just read and understand

- Previous medical history: hypertension
- Medications: anti-hypertensives (diuretics) + oral contraceptive
- Family history: grandfather with a dizziness problem
- Social history: former smoker, occasional alcohol
- Normal vitals; blood pressure, heart rate
- Uncomfortable lying supine
- **Horizontal nystagmus with left gaze, decreased hearing in left ear (most important)**
- Neuro: romberg test (+), mild gait ataxia (uncoordinated movements)

→ **Middle aged female + hearing problems and tinnitus + hours of vertigo → think of menier's**

Menier's disease:

hypertension localized to the inner ear, increases the pressure in the labyrinth which causes rupture in the membranes leading to mixing of the perilymph and the endolymph
→ All labyrinth is affected → hearing and vestibular issues.

Tinnitus, hearing loss, vertigo for hours → triad of menier's

physical examination during attacks → nystagmus, otherwise no other neural illnesses

Look at this audiogram: see the drop in the blue line, it shows decreased hearing of the left ear at lower frequencies.

Overtime, can lead to permanent disabilities in hearing or vestibular functions; chronic imbalance.

Diagnosis:

Clinically, audiometry, vestibular function testing, MRI/MRA to rule out other causes

Common Audiogram in Meniere's Disease



- In the early stages of Meniere's, the hearing loss effects only the low frequencies
- As the disease progresses, the hearing loss will flatten
- Usually results in poor word recognition scores

From: www.hearinglink.org

→ If we have unconventional cases of menier's we need to refer to the criteria table (if you met two or more criteria then it's most likely menier's).

Treatment:

- Acute (during attack): symptomatic meds (vestibular suppressants) + steroids
- Prophylaxis: decrease salts, caffeine, alcohol, nicotine
- Diuretics: triamterene hydrochlorothiazide (dyazide)

- No cure but vertigo can improve
- Other: vestibular rehabilitation, Maniett device, intratympanic gentamicin, endolymphatic sac procedures, vestibular neurectomy, labyrinthectomy (very rare).

**Case5: 72-year-old lady gets dizzy while putting the dishes away

signs and symptoms:

Feels like things are spinning, occurs whenever she looks up to put dishes on a high shelf. Lasts about a minute, resolves if she holds still. She's fine between episodes.

In this case the age is very important → we must rule out central serious causes, neurological or cardiovascular.

History: very important

- Previous medical history: hypertension
- Medications: ibuprofen, diuretics
- Family history: father died of myocardial infarction at 62

Examination:

- Orthostatic/postural hypotension: a transient drop in blood pressure when sitting up
- We stopped her diuretics but still the symptoms unchanged.
- Dix-hallpike test was positive for vertigo but inconclusive for nystagmus.
- **Carotid doppler ultrasound showed right internal carotid artery stenosis and backflow of left vertebral artery: subclavian steal syndrome**

**in this syndrome, flexion of the neck increases the stenosis which causes the transient drop in blood pressure

Treatment: Symptoms resolve with stenting of left subclavian artery.

Vertebrobasilar insufficiency (transient ischemic attack) -the subclavian steal syndrome is part of this syndrome

- Brainstem ischemia
- Embolic, atherosclerotic occlusions of vertebrobasilar arterial system.
- Can happen in the Rotational vertebral artery.

Indications for further testing:

- If the diagnosis is uncertain or refractory (resistant) BPPV
- Red flags → rule out central causes (risk factors for cardiovascular disease)

Diagnosed through MRI/MRA, carotid doppler.

Good luck 🍀