I'm so dizzy, my head is spinning…

Evaluation of the Patient with Dizziness

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Objectives

At the end of the session, the participant will be able to:

• Describe relationship between the cochlear labyrinth and balance (10 mins)
• Differentiate peripheral vertigo from central vertigo (25 mins)
• Develop a differential diagnosis for vertigo based on peripheral and central etiologies (25 mins)

Cochlear Labyrinth

Hearing Apparatus

Vestibular Labyrinth

Otolithic Organs: linear balance

Vestibular Labyrinth

Semicircular canals: angular motion

Speaker has no relationship to disclose.
...but it’s more than ears!

1. Vestibular labyrinths (2 of them!)
2. Vestibular portion of 8th CN
3. Brainstem vestibular nuclei
4. Cerebellum
5. Ocular motor nuclei
6. Spinal cord
7. Vestibulospinal pathways
   (maintain posture)

CC: “I’m dizzy”

Patient’s descriptions vary:
- “Things are spinning/moving”
- “I feel like I’m spinning/moving/ floating”
- “I feel woozy”
- “My vision is blurry”
- “I feel faint, lightheaded”
- “I feel off balance, unsteady”

What is dizziness?

A non-specific term to describe:
- Vertigo: an acute asymmetry of the vestibular system
- Disequilibrium: sense of imbalance that occurs almost always when walking
- Pre-syncope: prodromal symptom of fainting or near faint

Dizziness Etiologies

Varies by Age

40% Vertigo
10% Central brainstem vestibular lesion
15% Psychiatric disorder
25% Pre-Syncope, disequilibrium
10% Unknown


Differential Diagnosis

Can be HUGE!

Initial approach is to determine:
- Vertigo
- Disequilibrium
- Pre-syncope

History is Critical!

- Ask open ended questions
- Listen to description of symptoms
- Evaluate time course
- Elicit provocative, aggravating symptoms
- Age?
- Pre-existing conditions?
- Findings on exam?
**Vertigo**

Arises from an *acute asymmetry* of the vestibular system
- Damage or dysfunction in the labyrinth
- Vestibular nerve
- Central vestibular structures in the brainstem

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**Vertigo**

Peripheral (80%)
- BPPV
- Vestibular neuritis
- Herpes zoster oticus
- Meniere Disease
- Acoustic neuroma
- Otitis media
- Others

Central (?)
- Vestibular migraine
- Brainstem ischemia
- Cerebellar infarction
- Multiple Sclerosis
- Others

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**Vertigo**

- Brief spinning sensation
- Precipitated by turning in bed or tilting the head backward to look up
- Dizziness is brief, usually seconds, rarely longer

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**Benign Paroxysmal Positional Vertigo (BPPV)**

- Most common cause of vertigo is BPPV
- Attributed to calcium debris within the posterior semicircular canal ("canalithiasis")
- PC-BPPV

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**BPPV History**

**Classic Findings**
- Nausea, rarely vomiting (if acute and brief)
- Recurrent, brief (<1 minute) episodes of vertigo that are provoked by specific types of head movements
- Denies ear pain
- Denies hearing loss
- Denies tinnitus

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**Diagnosis of BPPV**

- Classic findings in history
- + Dix-Hallpike maneuver
  - designed to reproduce vertigo and elicit nystagmus
  - most useful in patients who do not have symptoms or nystagmus at rest

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Dix-Hallpike Maneuver

- The Dix-Hallpike maneuver tests for canalithiasis of the posterior semicircular canal
- Posterior— the most common cause of (PC-BPPV)


PC-BPPV Dx Criteria

- Dix-Hallpike usually provokes paroxysmal vertigo and nystagmus if posterior canal dysfunction is present
- The nystagmus and vertigo usually appear after a latency of a few seconds and lasts less than 30 seconds

PC-BPPV Dx Criteria

- After the patient sits up, the nystagmus will recur but in the opposite direction
- The maneuver should be repeated to the same side

PC-BPPV Dx

- The latency, transience, and fatigability, coupled with the typical mixed horizontal/rotatory direction, are important in diagnosing benign paroxysmal positional vertigo due to posterior canalithiasis

HC-BPPV Dx

“Bow and Lean” test:
• Seated patient first bends his or her head forward, aligning the horizontal canal with the gravity vector, and then leans his or her head backward, flipping the horizontal canal 180°


HC-BPPV Dx

• Horizontal canalithiasis (HC-BPPV):
• “Bow and Lean” test:
• Right horizontal canalithiasis will cause a right beating nystagmus during the bow and a left beating nystagmus during the lean


AC-BPPV Dx

• Anterior canalithiasis (AC-BPPV):
• Anterior canal BPPV (also known as the superior canal BPPV)
• Dix-Hallpike maneuver
• Nystagmus is downbeat and torsional, with the top of the eye torting away from the lower ear


AC-BPPV Dx

• The latency, duration, and fatigability are similar
• It is rare, accounting for only about 1 to 2 percent of patients with BPPV (likely due to its anatomic position that makes it difficult for debris to enter)


BPPV: PC vs AC

Posterior Canal
• Dix-Hallpike
• Nystagmus: upbeat and torsional

Anterior Canal
• Dix-Hallpike
• Nystagmus: downbeat and torsional


Suppose....
History is similar to BPPV EXCEPT there are no nystagmus?

Now what?
### Subjective BPPV

- Classic BPPV history
- Negative nystagmus
- Absence of clinical findings suspicious for central pathology


### Pathophysiology of BPPV

- Otoconia = Canaliths = Otoliths
- Made of calcium carbonate
- Usually attached to the otolithic membrane in utricle


### Detachment

Trauma, infection, aging can cause otoliths to detach from the utricle and collect within the semicircular canals

0.8 mm in diameter

Head movements shift the detached otoliths and stimulate nerve hairs to send false signals to the brain =

dizziness

### Treatment BPPV

- “Particle repositioning maneuvers” (head position changes) move otoliths back to the utricle
- Epley maneuver and Semont maneuver
- Modified Epley and modified Semont maneuver (Self-treatments)
- A prescription for the Epley maneuver: www.youtube.com


### Treatment BPPV

Once back in the utricle, the canaliths may re-adhere, dissolve, break up
Treatment BPPV

- Recurrence rates very low after repositioning (CRP)
- CRP is very effective, with an approximate cure rate of 80%


Mr. L

46 year old male who is a smoker but otherwise healthy and takes no meds. He presents today with acute onset of severe vertigo with nausea, vomiting, and gait instability. It began this morning (about 4 hours ago) when he tried to get out of bed. His wife has driven him to your clinic.

Mr. L: On exam

- Alert, oriented x3
- He was able to walk into the exam room with help but was leaning to his left
- Absent: dysarthria, dysphagia, weakness, sensory loss, facial droop, limb dysmetria
- His eyes are closed because he complains of the room spinning when his eyes are open

Mr. L: On exam

- Demonstrates spontaneous vestibular nystagmus that is horizontal-torsional
- Nystagmus is suppressed with visual fixation

Mr. L: On exam

Positive head thrust test:
With rapid turning of the head toward the side of the lesion by the examiner, the patient is unable to maintain visual fixation
So what’s the significance of a positive head thrust?

Mr. L: So what do we have?
Clinical Findings:
- An acute, spontaneous, peripheral vestibular ailment, characterized by the rapid onset of severe vertigo with nausea, vomiting, and gait instability
- No dysarthria, dysphagia, weakness, sensory loss, facial droop, or limb dysmetria
- Spontaneous vestibular nystagmus that is horizontal-torsional, that is suppressed with visual fixation
- Positive head thrust
- Auditory function is preserved
**Mr. L’s Dx:**

Vestibular neuritis
- AKA: vestibular neuronitis
- An acute, spontaneous, peripheral vestibular ailment
- Usually a viral or post-viral inflammatory disorder affecting the vestibular portion of the eighth cranial nerve


**Mr. L:**

When these clinical findings are combined with unilateral hearing loss, it is called *labyrinthitis*


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**Vertigo with Hearing Loss**

What’s in the differential diagnosis?
- Labyrinthitis
- Meniere’s Disease


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**Meniere’s Disease**

“Endolymphatic hydrops”
- Distortion and distention of membranous, endolymph-containing portions of the labyrinth


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**Meniere’s Disease**

Diagnosis based on clinical presentation:
- History
- Neurologic exam
- Clinical response to medical management (diuretics)

Meniere’s Disease FYI

Patients usually have some variable auditory and/or vestibular symptoms for 3-5 years before they meet the diagnostic criteria for Meniere disease.

Meniere’s Disease

*Diagnostic criteria* requires the following:

- 2 spontaneous episodes of rotational vertigo lasting at least 20 minutes
- Audiometric confirmation of sensorineural hearing loss
- Tinnitus and/or a perception of aural fullness

So….Back to Mr. L: 46 year old.....

- An acute, spontaneous, peripheral vestibular ailment, characterized by the rapid onset of severe vertigo with nausea, vomiting, and gait instability
- No dysarthria, dysphagia, weakness, sensory loss, facial droop, or limb dysmetria
- Spontaneous vestibular nystagmus that is horizontal-torsional, that is suppressed with visual fixation
- Positive head thrust
- Auditory function is preserved

Suppose Mr. L....

76 year old male who is a smoker with HTN, hyperlipidemia, DM?

He presents today with acute onset of severe vertigo with nausea, vomiting, and gait instability. It began this morning when he tried to get out of bed. His wife has driven him to the clinic.

Mr. L

Differential Diagnosis:

- Vascular event (hemorrhage or infarct) in the central nervous system affecting the cerebellum and/or brainstem
- Must be considered in all patients with vascular risk factors

Vascular vs Vestibular Event

**Vascular Event**

- Nystagmus not suppressed with visual fixation!
- Patients are usually unable to stand or walk unsupported


Vascular vs Vestibular Event

Vascular Event

- Limb dysmetria, dysarthria, or headache may be present
- Head thrust test is usually normal
- Symptoms may be unremitting (72 hours or more)
- Patient is usually older with atherosclerosis risk factors (hypertension, diabetes, smoking)


Vascular vs Vestibular Event

When the diagnosis is unclear, consider:

- MRI, MRA is preferred (over CT)
- MRI can detect infarction in the posterior fossa on the first day
- MRA has a specificity and sensitivity exceeding 95 percent in detecting stenosis or occlusion of the posterior circulation


Vascular vs Vestibular Event

- Most common stroke associated with vertigo is lateral medullary infarction (vestibular nuclei dysfunction → vertigo, vomiting, nystagmus)
- The vertigo, nausea, and vomiting may overwhelm the clinical picture


Back to Mr. L...prognosis

Vestibular neuritis

- Symptoms usually severe 1-2 days
- Then, gradual improvement in symptoms and a return of equilibrium
- Acute illness rarely lasts more than several days to a few weeks
- Residual imbalance and nonspecific dizziness may persist for months
- If early improvement in symptoms, due to central compensation


Ms. D

68 year old female who has hypertension, type 2 diabetes, and hyperlipidemia, BMI is 32. She presents today with acute onset of severe, persistent vertigo with nausea, intermittent vomiting. She has taken OTC dimenhydrinate (Dramamine) with minimal improvement in her vertigo symptoms. Her adult daughter has driven her to the clinic.

Ms. D

She states that she had a sudden onset of severe vertigo yesterday late morning while at work. She had to be driven home by a co-worker. Today she complains of right sided facial numbness which started sometime over night. There is some drooping of her right lip and she is having difficulty drinking through a straw.
Ms. D
Her face appears asymmetrical. She states that her hearing is muffled on the right side and her right ear hurts.

Ms. D
There are vesicles in the right auditory canal and right auricle!

Ms. D has.....
Herpes zoster oticus
- Ramsay Hunt syndrome
- Reactivation of latent herpes zoster infection of the geniculate ganglion
- Second most common cause of atraumatic peripheral facial paralysis
- Accompanied by tinnitus, hearing loss, N/V, vertigo, nystagmus present

Ramsay Hunt Syndrome
- Otologic complication of VZV reactivation
- Triad: ipsilateral facial paralysis, ear pain, and vesicles in the auditory canal and auricle
- Taste perception, hearing (tinnitus, hyperacusis), and lacrimation are affected in selected patients

Ramsay Hunt Syndrome
- Frequent involvement of cranial nerves V, IX, and X (subsequent spread of the inflammatory process to involve the eighth cranial nerve)
- Reported in association with herpes simplex type 2 infection

Ramsay Hunt Syndrome
- Facial paralysis generally more severe than Bell’s palsy attributed to HSV
- Increased rates of late neural denervation and a decreased probability of complete recovery
- Antiviral therapy/steroids prescribed
- Permanent facial muscle weakness and deafness without prompt treatment


Etiologies of Vertigo are Varied!

*Benign to life threatening*

You need a plan to approach the patient!

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**Diagnostic Approach**

Confirm that it’s vertigo and not:
- Disequilibrium
- Pre-syncope
- Something else

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**Confirm Vertigo**

A non-specific term to describe:
- Vertigo: an acute asymmetry of the vestibular system
- Disequilibrium: sense of imbalance that occurs almost always when walking
- Pre-syncope: prodromal symptom of fainting or near faint

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**Is it Peripheral or Central?**

- Is there nystagmus?
- Presence or absence of postural instability
- Hearing loss or tinnitus
- Other neurologic signs

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**Central vs. Peripheral**

<table>
<thead>
<tr>
<th></th>
<th>Peripheral</th>
<th>Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of Visual Fixation on Nystagmus</td>
<td>Suppressed</td>
<td>Not suppressed</td>
</tr>
<tr>
<td>Neurologic Signs</td>
<td>Absent</td>
<td>+/- Present</td>
</tr>
<tr>
<td>Postural Instability</td>
<td>Able to walk</td>
<td>+/-Ambulate Gait Instability</td>
</tr>
<tr>
<td>Hearing Deficit</td>
<td>Maybe</td>
<td>No hearing deficit</td>
</tr>
<tr>
<td>Nystagmus</td>
<td>Horizontal with torsional component</td>
<td>Any</td>
</tr>
</tbody>
</table>

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**Vertigo Etiology**

<table>
<thead>
<tr>
<th></th>
<th>Peripheral</th>
<th>Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPPV</td>
<td></td>
<td>Cerebellar stroke</td>
</tr>
<tr>
<td>Vestibular neuritis</td>
<td></td>
<td>Brainstem ischemia</td>
</tr>
<tr>
<td>Ramsay Hunt syndrome</td>
<td></td>
<td>Vestibular migraine</td>
</tr>
<tr>
<td>Meniere Disease</td>
<td></td>
<td>Multiple sclerosis</td>
</tr>
<tr>
<td>Medication related: aminoglycosides</td>
<td>Chiari malformation</td>
<td></td>
</tr>
</tbody>
</table>
FYI: Common things are Common!

Consider the most common things first!

Consider Time Course: Acute onset, sustained

Differential diagnosis:
• Vestibular neuritis
• Demyelinating disease
• Cerebellar or brainstem stroke

Consider Time Course: Episodic

Differential diagnosis:
• BPPV: very brief, reproducible with Dix Hallpike
• Ménière’s disease: minutes to hours, ear fullness
• Migrainous vertigo: minutes to hours, headache
• Vertebrobasilar ischemia: minutes, neuro symptoms

Take Home Points
1. Confirm that it’s vertigo
2. Establish central or peripheral
3. Consider common things first
4. Consider the time course
5. Go make a good diagnosis!

Thank you!

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