# IN THE NAME OF GOD

# Approach to the History and Evaluation of Vertigo and Dizziness in Neurology

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- **Equilibrium** is the ability to maintain orientation of the body and its parts in relation to external space.
- It depends on
  - continuous visual,
  - labyrinthine,
  - somatosensory input and its integration in the brainstem and cerebellum
- Disorders of equilibrium result from diseases that affect
  - central or peripheral vestibular pathways,
  - the cerebellum,
  - or sensory pathways involved in proprioception.
- Such disorders usually present with one of two clinical problems: vertigo or ataxia

# Vertigo

- Vertigo is the illusion of movement of the body or the environment

# Epidemiology

- One of the most common principal complaints
- A recent population-based telephone survey in Germany showed nearly 30% of the population had experienced **moderate to severe dizziness.**
- Though most subjects reported nonspecific forms of dizziness, nearly a quarter had true vertigo
- Dizziness is more common among **females and older people**

# Distinction between Vertigo & Other Symptoms

- Vertigo must be distinguished from no vertiginous dizziness, which includes sensations of light-headedness, faintness, or giddiness not associated with an illusion of movement

- In contrast to vertigo, these sensations are produced by conditions that impair the brain's supply of blood, oxygen, or glucose ( excessive vagal stimulation, orthostatic hypotension, cardiac arrhythmias, myocardial ischemia, hypoxia, or hypoglycemia) and may culminate in loss of consciousness

# VESTIBULO VISUAL SYMPTOMS

VISUAL SYMPTOMS RESULTING FROM VESTIBULAR DYSFUNCTION OR FROM THE INTERACTION OF THE VISUAL AND VESTIBULAR SYSTEMS; **EXAMPLES INCLUDE VISUAL ILLUSIONS THAT THE ENVIRONMENT IS TILTED OR BLURRING OF VISUAL LAG DURING HEAD MOVEMENTS; CATEGORIZED AS EXTERNAL VERTIGO**

**External vertigo: illusion that the visual surround is spinning or flowing**

**Oscillopsia: the perception that the visual surround is oscillating or bouncing**

# Common Vestibular Disorders Associated With Major Syndrome

- **Acute vestibular syndrome**

- A syndrome of acute-onset, continuous vertigo,
- dizziness, and unsteadiness lasting days to weeks
- often associated with nausea, vomiting, nystagmus,
- vertigo or dizziness aggravated by head motion in any direction

Vestibular neuritis, stroke causing vertigo, acute drug toxicity, demyelinating disease vestibulopathy, Wernicke syndrome, selective serotonin reuptake inhibitor (SSRI) or serotonin norepinephrine reuptake inhibitor (SNRI) discontinuation

## Episodic vestibular syndrome

- A syndrome of recurrent spells of vertigo, dizziness,or unsteadiness lasting seconds to hours,occasionally days.
- with brief periods of nausea, nystagmus
- loss of balance, headache, central nervous system symptoms, or hearing symptoms

Spontaneous: vestibular migraine, Meniere disease, transient ischemic attack (vertebrobasilar insufficiency), vestibular paroxysmal, cardiac causes (aortic stenosis, arrhythmia), episodic ataxias

Triggered: benign paroxysmal positional vertigo, orthostatic intolerance or hypotension, motion sickness, central positional vertigo

## Chronic vestibular syndrome

- A syndrome of chronic vertigo, dizziness
- unsteadiness lasting months to years; symptom
- descriptions may include gait unsteadiness, ataxia,
- hearing loss, nausea, nystagmus, or oscillopsia
- result from a progressive neurodegenerative disorder
- evolving symptoms between episodic vestibular

bilateralvestibulopathy, late effects of stroke, cerebellar ataxias, posterior fossa neoplasms, chronic visually induced vertigo or dizziness,

# examination

The neurologic examination of the patient with dizziness or vertigo

Included:

evaluation for potential related signs such as **Horner syndrome, hemisensory deficits, unilateral facial weakness, dysarthria, limb ataxia, dysconjugate gaze, head tilt, spasticity, abnormal reflexes, or distal somatosensory deficits**,

These finding may be clues to localizing lesions in the cerebellum, brainstem, spinal cord, or peripheral nerves.

# Stance & Gait

- Observation of stance and gait is helpful in distinguishing between cerebellar, vestibular, and sensory ataxias.
- In any ataxic patient, the stance and gait are wide-based and unsteady, often associated with reeling or lurching movements.
- Patients with sensory ataxia and some with vestibular ataxia are, nevertheless, ultimately able to stand with the feet together, compensating for the loss of one source of sensory input (proprioceptive or labyrinthine) with another (visual). With sensory or vestibular disorders, unsteadiness increases and may result in falling (**Romberg sign**).

- Oscillation of the head or trunk  may be present.

- If a unilateral cerebellar hemisphere lesion is responsible, there is a tendency to deviate toward the side of the lesion when the patient attempts to walk in a straight line or circle or marches in place with eyes closed

- **Tandem** (heel-to-toe) **gait,** which requires walking with an exaggerated narrow base, is always impaired

- In **sensory ataxia** the gait is also wide-based and tandem gait is poor.
- In addition, walking is typically characterized by lifting the feet high off the ground and slapping them down heavily (**steppage gait**) because of impaired proprioception.
- Stability may be dramatically improved by letting the patient use a cane or lightly rest a hand on the examiner's arm for support.
- If the patient is made to walk in the dark or with eyes closed, gait is much more impaired.

# Ocular exam

- The eyes are examined in the primary position of gaze (looking directly forward) to detect malalignment in the horizontal or vertical plane.

- The patient is asked to turn the eyes in each of the cardinal directions of gaze to determine.
  - whether gaze paresis
  - or gaze-evoked nystagmus is present
- Nystagmus is characterized in terms of the positions of gaze in which it occurs, its amplitude, and the direction of its fast phase.
- **The direction of jerk nystagmus is defined by the direction of the fast component**.

- **Peripheral** vestibular disorders produce unidirectional horizontal jerk nystagmus that is maximal on gaze away from the involved side.

- **Central** vestibular disorders can cause unidirectional or bidirectional horizontal nystagmus, vertical nystagmus, or gaze paresis.

- **Cerebellar** lesions are associated with a wide range of ocular abnormalities, including gaze pareses, defective saccades or pursuits, nystagmus in any or all directions, and ocular dysmetria (overshoot of visual targets during saccadic eye movements).

# GAZE-EVOKED NYSTAGMUS

- Gaze-evoked nystagmus occurs when no spontaneous nystagmus is present but when the patient gazes to the right, right-beating nystagmus occurs, and when the patient looks to the left, left-beating nystagmus occurs.

- end point nystagmus. End point nystagmus occurs when the patient attempts to look at the extremes of horizontal gaze, usually approximately 45 degrees from the vertical meridian, and a small degree of nystagmus occurs.

- Pathologic gaze-evoked nystagmus is usually evident by 30 degrees of eccentric gaze or less.

# Laboratory Testing

- Blood tests for vertigo are rarely helpful as a matter of routine but may be indicated in some cases.
- Patients taking antiepileptic drugs that may account for dizziness or abnormal eye movements may need drug levels assessed.
- For patients with impaired balance, vitamin B12, methylmalonic acid, hemoglobin A1c, and thyroid function studies may be warranted.
- For patients with possible orthostatic dizziness, a complete blood cell count and comprehensive metabolic panel may be ordered.
- In patients with bilateral fluctuating hearing with or without vertigo and in whom autoimmune inner ear disease is suspected, an antinuclear antibody screen, erythrocyte sedimentation rate.

| Common dizziness/ vertigo descriptions | Onset | Timing/ duration | Triggers | Associated features | Classification of Vestibular Disorders syndrome[a] | Disorder |
|---|---|---|---|---|---|---|
| **Vestibular disorders** | | | | | | |
| Spinning, rotating, whirling, tilting, floating, or falling | Abrupt | 5–60 seconds | Tilting head back, rolling in bed, straightening after bending | Occasionally nausea, nystagmus with Dix-Hallpike test on affected side | Episodic vestibular syndrome | Benign paroxysmal positional vertigo |
| Spinning, whirling, rotating, tilting | Abrupt or evolving over 30 minutes with some variability | Days to weeks | No reliable trigger, 15% with antecedent upper respiratory infection symptoms | Worse with any head motion, nausea, direction-fixed nystagmus (early on), abnormal head impulse test to the side affected | Acute vestibular syndrome | Vestibular neuritis |
| Spinning, whirling, rotating, tilting | Abrupt or evolving over 30 minutes with some variability | Days to weeks | No reliable trigger, 15% with antecedent upper respiratory infection symptoms | Worse with any head motion, nausea, acute unilateral hearing loss, direction-fixed nystagmus (early on), abnormal head impulse test to the side affected | Acute vestibular syndrome | Labyrinthitis |

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| Common dizziness/ vertigo descriptions | Onset | Timing/ duration | Triggers | Associated features | International Classification of Vestibular Disorders syndrome[a] | Disorder |
|---|---|---|---|---|---|---|
| Severe spinning, whirling, rotating, imbalance | Abrupt or evolving over 30 minutes with some variability | 30 minutes to 12 hours | No reliable trigger in most cases | Unilateral tinnitus and hearing loss that may fluctuate on the affected side; worse during head motion; low-frequency hearing loss on the affected side | Episodic vestibular syndrome | Ménière disease |
| Reduced equilibrium, unsteadiness worse during movements | Usually insidious, occasionally more abrupt depending on mechanism | Continuous symptoms worse during head movements or in darkness | No trigger | Bilateral abnormal head impulse test, positive Romberg sign, reduced dynamic visual acuity | Chronic vestibular syndrome | Bilateral vestibulopathy |
| Spinning, tilting, oscillopsia, floating sometimes induced by sounds[23] | Insidious but occasionally patients describe a sensation of "popping" at onset | Spinning, tilting, oscillopsia, floating may last seconds to minutes recurrently; autophony,[b] tinnitus, ear fullness, and hearing may be fairly continuous | Sounds may trigger spells of worse symptoms | Autophony, unilateral ear pressure or fullness and hearing reduction, tinnitus; occasionally nystagmus can be induced by noise or vibration on examination | Episodic vestibular syndrome | Superior canal dehiscence |

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| Common dizziness/ vertigo descriptions | Onset | Timing/ duration | Triggers | Associated features | International Classification of Vestibular Disorders syndrome[a] | Disorder |
|---|---|---|---|---|---|---|
| **Hemodynamic disorders** | | | | | | |
| Near-faintness, "about to pass out," "lightheadedness"[24] | Abrupt, usually when standing | Minutes, may be recurrent on standing; may culminate in syncope or abate in minutes | Most events occur or are evoked when upright | Pallor, diaphoresis, nausea, may culminate in syncope, symptoms relieved by lying flat; abnormal orthostatic heart rate/ blood pressure | Episodic vestibular syndrome | Orthostatic dizziness (orthostatic intolerance, orthostatic hypotension) |

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| Common dizziness/ vertigo descriptions | Onset | Timing/ duration | Triggers | Associated features | International Classification of Vestibular Disorders syndrome[a] | Disorder |
|---|---|---|---|---|---|---|
| **Central nervous system and related disorders** | | | | | | |
| Spinning, tilting, rocking, floating, visually induced vertigo/dizziness, motion sensitivity | Abrupt or more gradual, sometimes discrete spells, sometimes constant but varying in intensity | Spinning, tilting, rocking, floating may vary from brief quick spins lasting a few seconds recurrently to spells lasting minutes to much of the day; visually induced vertigo/ dizziness, motion sensitivity may be nearly constant | No reliable triggers | Migraine headache history, periodic photophobia or phonophobia; examination is usually normal | Episodic vestibular syndrome | Vestibular migraine |

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| Common dizziness/ vertigo descriptions | Onset | Timing/ duration | Triggers | Associated features | International Classification of Vestibular Disorders syndrome[a] | Disorder |
|---|---|---|---|---|---|---|
| Vertigo, poor equilibrium or ataxia | Abrupt | Continues, may see some gradual improvement in days to months depending on size and location of infarction | No trigger | Nausea, poor gait balance; possibly gaze-evoked nystagmus, diplopia, dysarthria, normal head impulse test, possibly hemiataxia and other central nervous system signs[26,c] | Acute vestibular syndrome | Stroke |
| Impaired balance worse with head movement, less commonly with position changes[27] | Usually insidious; abrupt onset may occur with cerebellar stroke or hemorrhage or with episodic ataxias or acute cerebellitis | Continuous for degenerative and lesion-based cerebellar disease | No trigger | Balance worsens with fatigue, alcohol, sedation; gaze-evoked or vertical nystagmus; limb and truncal ataxia, dysarthria, abnormal pursuit, and saccadic eye movements | Chronic vestibular syndrome | Cerebellar dizziness (from a variety of cerebellar disorders) |

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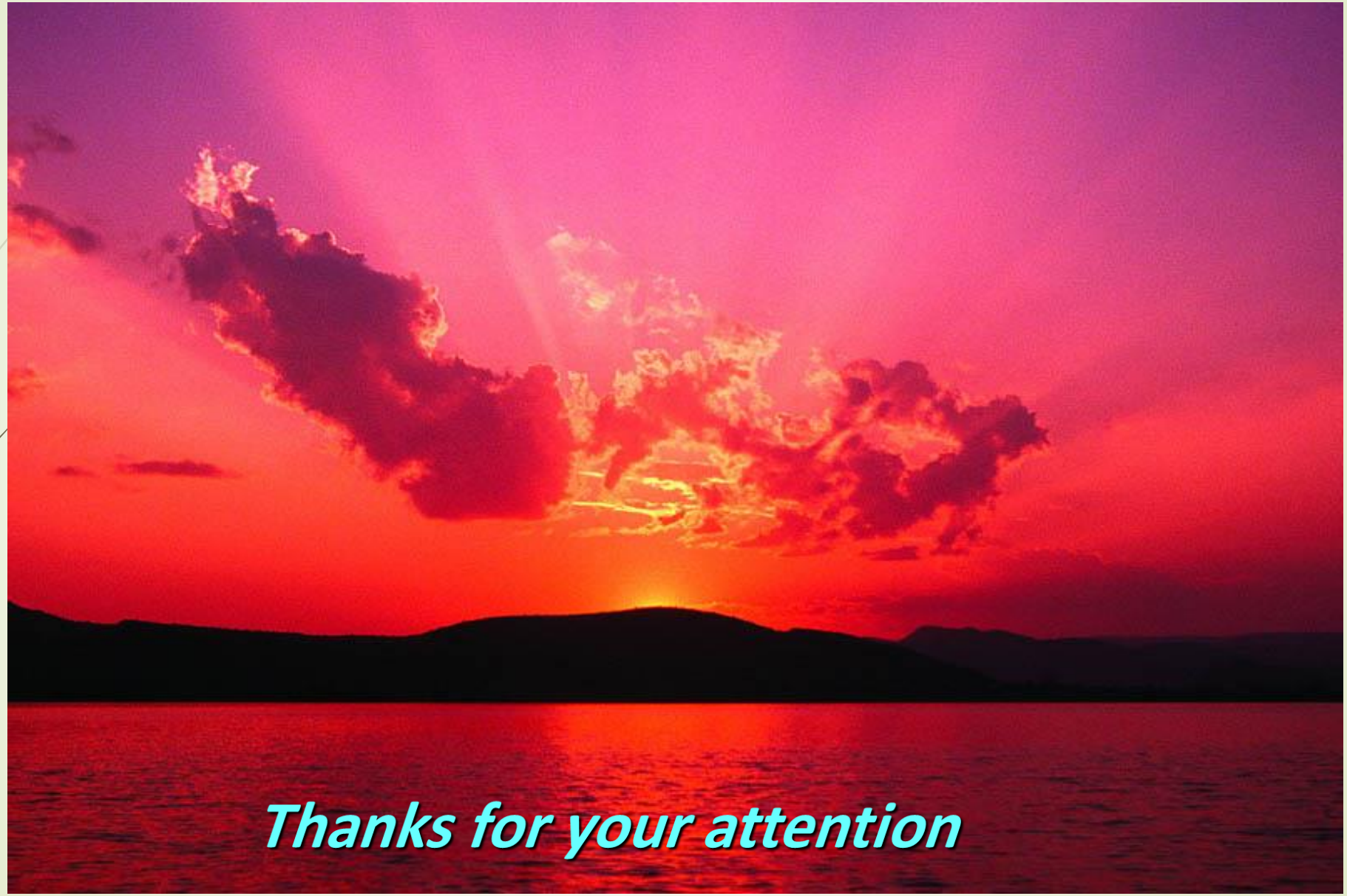
- ***Posterior Fossa Structural Abnormalities***
- ***Neurodegenerative Disorders***
- ***Epilepsy***
  - Vestibular symptoms are common with focal seizures, particularly those originating from the temporal and parietal lobes.
  - The key to differentiating vertigo with seizures from other causes of vertigo is that seizures are almost invariably associated with an altered level of consciousness.
  - **Episodic vertigo as an isolated manifestation of a focal seizure is a rarity if it occurs at all.**

# Imaging Studies

- A noncontrast head CT has a very low yield of identifying a cause when patients with headache, trauma to the head and neck, altered mental status, focal neurologic deficits, or recent head or neck surgery are excluded.
- Temporal bone CT is indicated to identify lesions such as cholesteatoma or lesions within the labyrinth, including canal dehiscence.
- Brain MRI without contrast is a reasonable first step, and MRI with and without contrast is warranted if a vestibular schwannoma or other structural lesion of the cerebellopontine angle is a consideration.
- Head and neck CT angiography (CTA) or head and neck magnetic resonanceangiography (MRA) may be appropriate when dizziness or vertigo may have avascular cause.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