# APPROACH TO DIZZINESS AND VERTIGO

Alex Fraser, MD Neurologist/Neuro-ophthalmologist Nov. 9, 2021

(Left beating nystagmus)



## Disclosure of Financial Support and Conflict of Interest

- This program has received no financial support.
- Potential for conflict(s) of interest:
  - Planning Committee members Dr. Mai, Dr. <u>Megyesi</u>, Dr. Jenkins and Dr. <u>Wickett</u> have disclosed no conflicts of interest.
  - Planning Committee member Dr. Venance has received honoraria for participating in a virtual advisory board for Sanofi Genzyme.







# **Mitigating Potential Bias**

- The presentations will have potential bias managed by ensuring that data and recommendations are presented in a fair and balanced way.
- The presenters will speak to a full range of products that can be used in this therapeutic area.
- All speakers have been advised that information presented must be explicitly evidence-based.
- The committee reviewed each speakers COI disclosure form and disclosure slides to ensure no bias exists.







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# **Faculty/Presenter Disclosure**

- Faculty: Alex Fraser
- Relationships with financial sponsors: N/A









- 1) What is the best test for ruling out brainstem/cerebellar infarct in a patient with 36 hours of sustained vertigo?
  - A) Physical examination
  - B) CT head
  - C) MRI head
  - D) Brainstem auditory evoked potentials

- 2) Your 75yo patient has been having recurrent 30-second episodes of intense dizziness, brought on by normal head movements, and especially by bending over to tie her shoes, or getting into/out of her bed.
- As a result, she has been afraid to move for the past 6 months and barely leaves her house. She asks you, "How much longer must I live like this?"
- What is your response?
  - A) "I can probably diagnose and fix this problem all by myself in the next 2 minutes!"
  - B) "I'll refer you to the Urgent Neurology Clinic, and they should see you within the next 2 weeks!"
  - C) "Just be patient. This problem will go away on its own, but it might take 2 months!"
  - D) "What do you mean by 'dizzy'?"

 3a) What important examination finding do you see depicted here in this patient with 3 days of sustained vertigo?

 3b) Are you reassured by this finding or worried by it?



# OBJECTIVES

- 1) Explain the difference between the terms 'vertigo' and 'dizziness'
- 2) Use a structured clinical history to narrow down causes for a complaint of 'dizziness'
  - Timing, triggers, associated symptoms
- 3) Describe the physical examination signs and maneuvers that best localize a complaint of 'vertigo':
  - Dix-Hallpike (and Epley)
  - HINTS exam
  - Strategies for virtual assessment

\*\*<u>Video credits:</u> Dan Gold, DO; Dept. of Neurology, Johns Hopkins University His amazing website: <u>novel.utah.edu/Gold</u>

#### "DIZZINESS" VS. "VERTIGO"

- Expert international consensus definitions (International Classification of Vestibular Disorders):
  - "Dizziness":
    - The sensation of disturbed or impaired spatial orientation without a false or distorted sense of motion
  - "Vertigo"
    - The sensation of self-motion when no self-motion is occurring

#### IN REALITY



less."

- "Dizziness":
  - Vertigo (illusion of movement)
  - Lightheadedness/presyncope
  - Imbalance/disequilibrium
  - Anxiety
  - Diplopia
  - Other...

#### THINGS THAT CAN CAUSE DIZZINESS/VERTIGO

- Neuro:
  - Stroke/TIA \*\*
  - Acute vestibular neuritis
  - Migraine
- ENT:
  - Benign Paroxysmal Positional Vertigo (BPPV)
  - Meniere's disease
  - Endolymphatic fistulae
  - Superior semicircular canal dehiscence
- Cardiac:
  - Orthostatic hypotension
  - Arrhythmia, structural heart disease
- Other:
  - Anxiety/depression/panic
  - Persistent postural perceptual dizziness (PPPD)

\*\* The elephant in the room

#### DIZZINESS VS. VERTIGO

- The history
  - 1) A common approach: "What do you mean by 'dizzy'?"
    - Not a great question!
      - Study by Newman-Toker
      - N=140, 62% chose >1 descriptor
      - When forced to pick just one, 52% chose something different 6 minutes later
  - 2) A better approach:
    - Timing
    - Triggers
    - Associated symptoms

#### TIMING, TRIGGERS, ASSOCIATED SYMPTOMS

- TIMING
  - Episodic?
  - Duration?
  - Acute and constant?
- ASSOCIATED SYMPTOMS
  - Unilateral hearing loss
  - Diplopia, dysarthria, ataxia, etc.
  - Nausea, vomiting
  - Autophony

- TRIGGERS
  - Certain actions, movements, situations?
    - Head movements
    - Rolling over in bed
    - Only when walking
    - Only when standing
    - Never when supine
    - Loud noises

#### EPISODIC DIZZINESS

Disorder	Timing	Triggers	Assoc. symptoms
BPPV	Episodic (seconds)	Positional: act of lying down or sitting up, bending forward, rolling over in bed	Vertigo, N/V
Orthostatic hypotension	Episodic (seconds)	Positional: standing up; never happens while supine	Lightheaded; vision goes dark; hearing muffled; knees weak; appears pale to bystanders
TIAs	Episodic (minutes)	Spontaneous	Vertigo, disequilibrium, dysarthria, ataxia, diplopia, etc.
Migraine	Episodic (minutes-hours)	Worse with movement	Vertigo, photophobia, phonophobia, N/V, motion sickness, ± H/A
Meniere's	Episodic (hours)	Spontaneous; salt intake	Vertigo, disequilibrium, aural fullness, hearing loss, 'roaring' low- pitched tinnitus

#### CONSTANT DIZZINESS: ACUTE VESTIBULAR SYNDROME (AVS)

Disorder	Timing	Triggers	Assoc. symptoms
Acute vestibular neuritis	Acute (onset <3d); lasts days-	Spontaneous; aggravated by head movements	Vertigo, disequilibrium, N/V (severe), oscillopsia
Wallenberg's syndrome (stroke)	Acute; lasts weeks <b>→</b> ∞	Spontaneous; aggravated by head movements	Vertigo, disequilibrium, N/V (mild-mod.), tilt, ataxia, crossed sensory loss, oscillopsia
Anxiety/Depression	Chronic	Spontaneous	Lightheaded, floating, rocking

#### PHYSICAL EXAMINATION

- Episodic (i.e., between episodes):
  - Think "BPPV"
    - Do Dix-Hallpike maneuver
    - Don't do HINTS exam
- Constant:
  - Think "AVS" (acute vestibular syndrome)
    - Do HINTS exam
    - Don't do Dix-Hallpike maneuver



#### PHYSICAL EXAMINATION (EPISODIC VERTIGO)

#### PHYSICAL EXAMINATION (EPISODIC)

- BPPV:
  - Otoconia from the utricle break free
  - Migrate into the semicircular canals (usually posterior SCC)
  - Cause havoc by sloshing around with head movements
    - Especially movements in the plane of the affected SCC.





#### SCC ANATOMY

- Useful knowledge:
  - Posterior SCC just happens to be in the same plane as the pinna of the ear
  - Can use pinna as a guide to BPPV
    physical exam maneuvers



#### DIX-HALLPIKE MANEUVER

- Examiner turns patient head 30-45° and quickly tips patient back, head hanging over edge of bed.
  - Sloshes endolymph around in the posterior SCC (preferentially).
  - Patient complains of intense vertigo if BPPV
  - Unpleasant for patients
- Watch for nystagmus (upbeat/torsional)
  - Latency of up to 30s
  - Lasts 90s (attenuates)
- <u>Tips:</u>
  - Warn the patient!
  - Premedicate with Gravol
  - Have bucket nearby
  - Tell the patient to keep their eyes wide open and stare at your nose, even if they feel like shutting their eyes





#### DIX-HALLPIKE IN ACTION (RIGHT SIDE)





## EPLEY MANEUVER (RIGHT BPPV)



#### BPPV PATIENT AFTER EPLEY



#### VIRTUAL DIX-HALLPIKE





#### PHYSICAL EXAMINATION (ACUTE VESTIBULAR SYNDROME)

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- Patient feels constantly dizzy/vertiginous at rest (not episodic)
- Goal is to:
  - Rule out stroke
  - Reassure ourselves that this is a peripheral vestibular problem instead
    - (e.g., vestibular neuritis)
- "<u>H I N T S</u>" exam
  - HI = head impulse test
  - N = nystagmus
  - TS = test for skew deviation



#### "<u>HI</u>NTS" EXAM

- 1) Head Impulse test
  - An assessment of the vestibuloocular reflex
  - Tests the vestibular system on the side you are thrusting towards
  - Normal:
    - Eyes stay locked on target, despite head thrusts





#### "<u>HI</u>NTS" EXAM

- Abnormal head impulse test
  - Eyes travel with head during the thrust
  - A "corrective saccade" is required after head thrust in order to refixate on the target.
  - Usually indicates an ipsilateral vestibular nerve problem (reflex arc)
- Not normal, but at least reassuring that it's not a stroke



Catch-Up Saccades When Head is Turned to Right

#### VIRTUAL ASSESSMENT OF HEAD IMPULSE TEST



Which side is affected?

#### "HINTS" EXAM

- 2) Nystagmus
  - Peripheral vestibular nystagmus:
    - Unidirectional
  - Central nystagmus:
    - Gaze-evoked (direction-changing)
    - Vertical



#### PERIPHERAL VESTIBULAR NYSTAGMUS (BENIGN)



Left-beating nystagmus from a right vestibular neuritis

#### PERIPHERAL VESTIBULAR NYSTAGMUS (BENIGN)





Unidirectional Left-Beating Nystagmus More in Left Gaze (Alexander's Law)

- Unidirectional
- Obeys "Alexander's Law"



#### CENTRAL NYSTAGMUS (WORRISOME)

- Gaze-evoked
  - Fast phase of nystagmus changes directions depending on direction of gaze:
    - Left-beating on left gaze
    - Right-beating on right gaze
    - Upbeating on upgaze
    - Downbeating on downgaze



#### "HIN<u>TS</u>" EXAM



(Extreme example)

- 3) Test for Skew
  - "Skew" = "skew deviation"
    - Abnormal finding!
    - One eye higher than the other
  - Happens with central vestibular lesions:
    - Unopposed inputs from one vestibular apparatus
    - Brain thinks head is tilting
    - Eyes reflexively counter-roll in response, like a see-saw:
      - One eye goes up
      - Other eye goes down

#### "HIN<u>TS</u>" EXAM

- 3) Test for skew deviation
  - Best examined using the "alternate cover test"
    - Ask patient to fixate on something in the distance
    - Cover each eye in turn, back and forth.
  - If there is a skew deviation, one eye is always deviated and has to move vertically to take up fixation when it is uncovered.
  - Watch for vertical refixation eye movements.



Skew deviation – R eye higher than L

#### "HINTS" EXAM: SUMMARY



#### VERTIGO: WHY NOT JUST GET NEUROIMAGING?

- CT head
  - Useless for vertigo, except to rule out big hemorrhages
- MRI head
  - Test of choice for posterior fossa lesions (i.e., vertigo)
  - Can still miss 15-20% of acute strokes within first 48h
- HINTS exam is more sensitive than MRI for detecting acute stroke
  - Worrisome HINTS exam: 100% sensitive; 96% specific
  - MRI: 88% sensitive; 100% specific

#### OTHER PHYSICAL EXAM FINDINGS

- Look for cerebellar findings:
  - Cranial nerves:
    - Dysarthria
  - Upper extremities:
    - Ataxic finger-to-nose
    - Impaired rapidly alternating movements
  - Lower extremities:
    - Ataxic heel-to-shin
    - Wide-based ataxic gait
- Also look for other brainstem findings:
  - Diplopia/strabismus, dysarthria, dysphagia, etc.

#### GAIT

- BPPV
  - Normal
  - Patient tries not to move their head, though
- Peripheral vertigo (e.g., vestibular neuritis)
  - Cautious, slow, tentative
  - But NARROW based
- Central vertigo
  - Ataxic, impaired
  - WIDE based

#### NON-VERTIGINOUS DIZZINESS

- Orthostatic vitals
  - Look for postural drop in BP (esp. if provokes symptoms)
- Cardiovascular exam
  - Arrhythmia?
  - Valve/structural heart disease?



#### POST-TEST



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- 3a) What important examination finding do you see depicted here in this patient with 3 days of sustained vertigo?
  - Corrective rightward saccade with left head thrust
  - (A "positive HIT" to left)
- 3b) Are you reassured by this finding or worried by it?
  - Reassured.
  - Implies an impaired VOR a feature favouring vestibular neuritis over stroke





#### THANK YOU

#### REFERENCES

- Most videos:
  - Novel.Utah.edu/Gold
- Content:
  - Saber Tehrani AS, Kattah JC, Kerber KA, et al. Diagnosing stroke in acute dizziness and vertigo: pitfalls and pearls. Stroke. 2018;49:788-795.
  - Shemesh AA, Gold DR. Dizziness and vertigo: the skillful examination. J Neuroophthalmol. 2020;40:e49-61.
  - Green KE, Pogson JM, Otero-Millan J, et al. Remote evaluation of acute vetigo: strategies and technological considerations. Neurology 2021;96:34-38.
- Miscellanous excellent sites about vertigo/dizziness:
  - Dizziness-and-balance.com
  - YouTube e.g., Epley maneuver (https://www.youtube.com/watch?v=9SLm76jQg3g)



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- Mark your calendars for the 2<sup>nd</sup> Tuesday of the month from 7:00 – 8:00 pm.
- Register on the Clinical Neurological Sciences Continual Medical Education webpage for upcoming talks:



- Dec 14<sup>th</sup>, 2021: Primary Care Management of Seizures and Epilepsy, Dr. Jorge <u>Burneo</u>
- Jan 11<sup>th</sup>, 2022: An Update on TIA and Stroke, Drs. Lauren Mai and Jennifer Mandzia
- Feb 8<sup>th</sup>, 2022: Approach to Migraine Management, Dr. Lik Hang Tommy Chan



