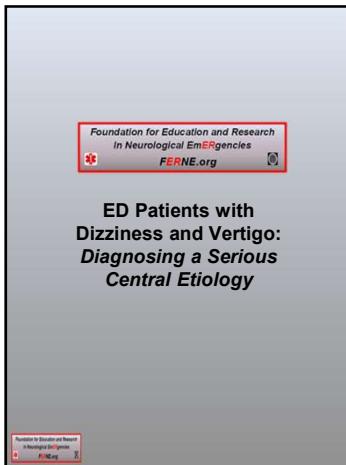


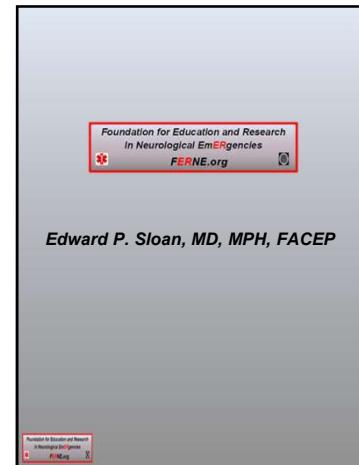
Dizzy/Vertigo Patients: Central Etiology?

Edward P Sloan, MD, MPH

Emergencies in Medicine Park City
March 1, 2023



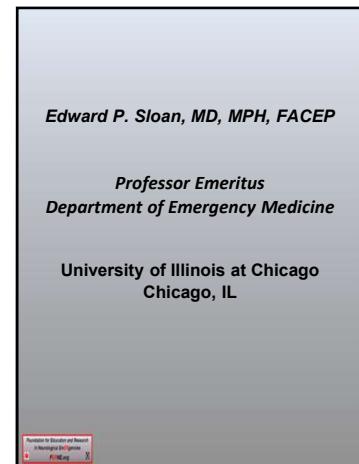
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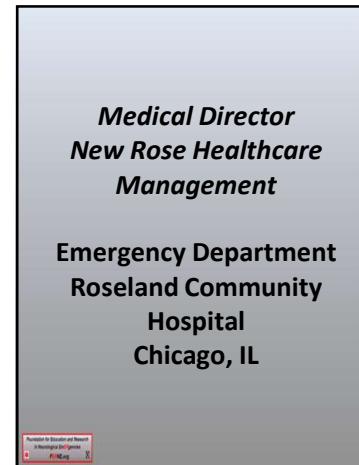
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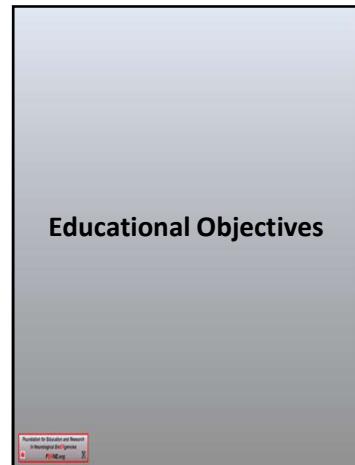
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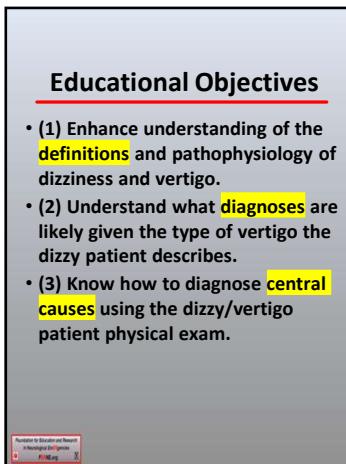
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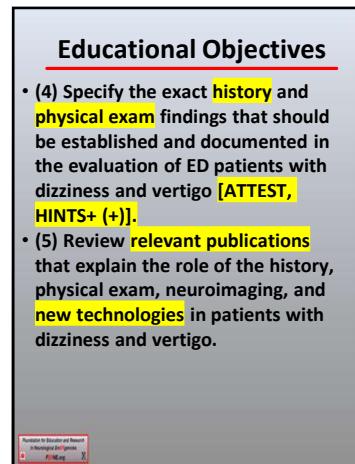
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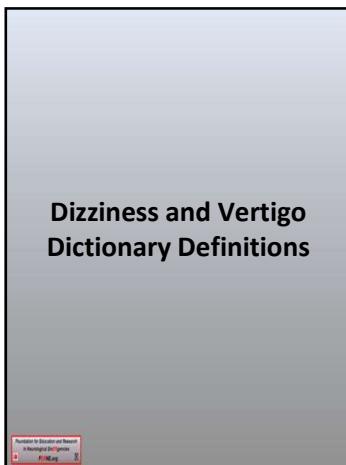
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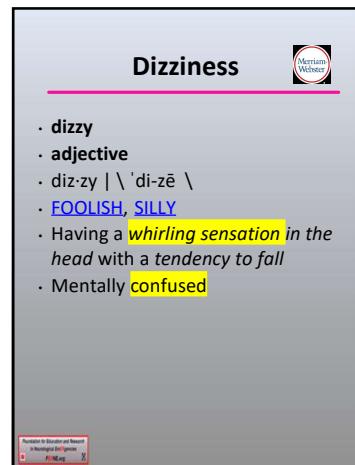
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12

Vertigo

Merriam-Webster

- **noun**
- ver-ti-go 'vər-ti-gō
- 1.
 - a: a sensation of motion in which the individual or the individual's surroundings seem to whirl dizzily
 - b: a dizzy **confused** state of mind
- Mentally confused

Merriam-Webster.com

13

Vertigo

Merriam-Webster

- **noun**
- ver-ti-go 'vər-ti-gō
- 2.
 - : disordered **vertiginous** **movement** as a symptom of disease in lower animals
- also
 - : a disease (such as giddiness) causing this

Merriam-Webster.com

14

Dizziness and Vertigo Consensus Definitions

Merriam-Webster.com

15

Dizziness and Vertigo Definitions

How have dizziness/vertigo terms been specified?

USING THE PHYSICAL EXAMINATION TO DIAGNOSE PATIENTS WITH ACUTE DIZZINESS AND VERTIGO

- Jonathan A. Edlow, MD*
- David Newman-Toker, MD, PhD†

Best Clinical Practice

Using the physical examination to diagnose patients with acute dizziness and vertigo

Journal of the American Medical Association, Volume 303, Number 12, June 2010, pp 1229-1236. DOI:10.1001/jama.2010.299. © 2010 American Medical Association. All rights reserved.

Merriam-Webster.com

16

Presyncope/ Near Syncope/ Faintness

How is presyncope defined by the consensus group?

- **Presyncope** (also **near syncope** or **faintness**) is the **sensation of impending loss of consciousness**.
- This sensation may or may not be followed by syncope.

© 2008 AHA. Van Buren M, Lempp T, Newman-Toker DE. Circulation. Definition of presyncope. Circulation. 2008;117(17):1705-1706. Task Force for the Definition and Classification of Presyncope. Executive Summary. Circulation. 2008;117(17):1707-1711. Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC2470030/. Last Update: 2008-02-20. Accessed: 2008-02-20.

Merriam-Webster.com

17

Syncope

How is syncope defined by the consensus group?

- **Syncope** (also **faint**) is:
 - **transient loss of consciousness**
 - **due to transient global cerebral hypoperfusion**
 - **characterized by rapid onset, short duration, and spontaneous complete recovery.**
- Syncope usually leads to **loss of postural control, falling**.

© 2008 AHA. Van Buren M, Lempp T, Newman-Toker DE. Circulation. Definition of syncope. Circulation. 2008;117(17):1705-1706. Task Force for the Definition and Classification of Presyncope. Executive Summary. Circulation. 2008;117(17):1707-1711. Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC2470030/. Last Update: 2008-02-20. Accessed: 2008-02-20.

Merriam-Webster.com

18

- How is unsteadiness defined by the consensus group?
- **Unsteadiness** (formerly known as *disequilibrium*) is:
 - *the feeling of being unstable*
 - *while seated, standing, or walking*
 - *without a particular directional preference.*
- **Cerebral ischemia?**

19

Directional Pulsion

20

Directional Pulsion

Skiing in a whiteout.

When stopping, eyes continue to move.

Body moves in an unusual way.

21

Vertigo

22

Vertigo

23

Dizziness

24

Dizziness and Vertigo Clinical History Questions

25

Dizzy/Vertigo Background Clinical Q

Syncope / Near syncope

- Did you lose consciousness (pass out) and woke up in a chair or on the ground?
- Did you feel faint and almost pass out, like when people see blood?

Unsteadiness / Directional Pulsion

- Did you feel unstable on your feet?
- Did you feel as if you were veering to the side?***
(Acute Cerebellar Ischemia)

26

Dizzy/Vertigo Clinical Questions

Vertigo

- Did you feel like you were moving even when still?
- Did you feel a spinning, rocking or tilting motion?
- Did you have the feeling of falling downward, as in an elevator?
- Did this occur with you moving your head?
- Did this occur while at rest and without motion?
- Have you had this type of episode before?
- Are you having these vertigo symptoms now?

27

Dizzy/Vertigo Clinical Questions

Dizziness

- Did you feel a sensation of disturbed or impaired spatial orientation (world seems visually odd)?
- Did you feel giddy, lightheaded, or dizzy?

28

Dizzy/Vertigo Clinical Questions

Past History

- Have you ever been diagnosed with syncope, near syncope, vertigo, or dizziness in the past?
- Have you ever been treated for low blood count, low blood pressure, low heart rate, or low blood sugar?

29

Clinical Questions Take Home Points

Questions Order

- Go in "reverse" order
- Start with syncope and near syncope
- Consider unsteadiness with standing/gait
- Probe vertigo symptoms (type/timing/triggers)
- Discuss feeling dizzy last
- Review systemic causes of dizzy/weakness symptoms

30

Clinical Diagnoses Take Home Points

Diagnoses

- Systemic diagnoses can be determined efficiently.
- Syncope/near syncope? Diagnosis established.
- Unsteady with standing/gait? Cerebellar ischemia?*
- Vertigo symptoms?
 - Current, continuous? Acute Vestibular Syndrome (AVS)*
 - Spontaneous episodic vertigo (sEVs)*
 - Triggered episodic vertigo (tEVs)
- Non-specific dizziness is the diagnosis of exclusion.

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**Relevant Disease States
That Can Cause
Dizziness/Vertigo**

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Dizziness/Vertigo Diagnoses

In Alphabetical Order:

- Alternobaric Vertigo (Ruptured TM)
- Benign Paroxysmal Positional Vertigo (BPPV)
- Brainstem Infarction*
- Central Vertigo*
- Cerebellar Dysfunction / Ischemia / Infarct*
- Anterior Ischemic Stroke / TIA*
- Labyrinthitis
- Meniere Disease

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Dizziness/Vertigo Diagnoses

In Alphabetical Order (Con't)

- Migraine-Associated Vertigo*
- Motion Sickness
- Peripheral Vertigo
- Persistent Postural-Perceptual Dizziness
- Vertebrobasilar Insufficiency / Stroke*
- Vestibular Neuritis

Wallenberg Syndrome*

Wallenberg syndrome is a neurovascular condition that is also referred to as lateral medullary syndrome or posterior inferior cerebellar artery syndrome.

ANATOMICAL LOCATIONS	Causing compression of part of the brainstem
Symptomatology	contralateral loss of pain and temperature, ataxia, nystagmus, Horner's syndrome, facial palsy, decreased gag reflex, decreased pain perception, sensory deficits, hemiparesis, sensory loss, sensory atrophy, sensory ataxia, sensory neuropathy, sensory dysesthesia, sensory allodynia

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**Diagnoses Related to
Three Vertigo Types**

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**Vertigo Types and
Likely Diagnoses**

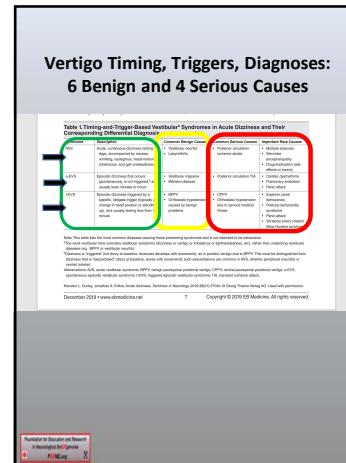
**What diagnoses are to be
considered based on the vertigo
timing, triggers, and current Sx?**

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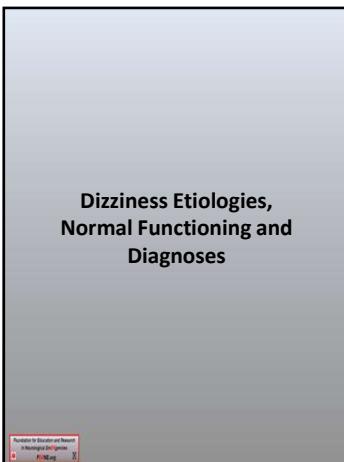
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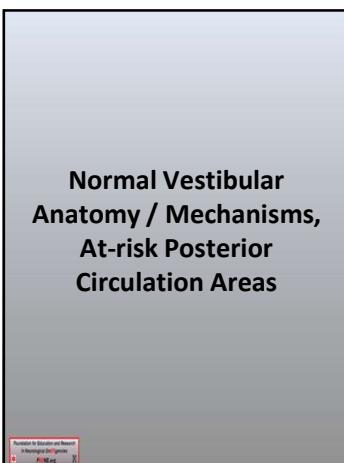
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42

Peripheral Vestibular Organs

43

44

Posterior Circulation Stroke

45

Dizziness / Vertigo Case Studies

46

Dizziness Case: Lightheaded 70 yo

47

Dizziness Case: Syncopal 58 yo

- 58-year-old male DM, NV x 3
- Syncope reported, but was such bad vertigo he had to lower himself to the ground
- Began 3 hours previously, suddenly
- Nystagmus to R, especially with gaze R
- HIT test +, skew neg, mild unsteady OK gait
- Call the stroke team?

48

Dizziness Case:
44 yo Dizzy Male

- Sign out. Just check the CT...
- 44-year-old male, Hx HTN, DM
- Six hours continuous dizziness
- Unsteadiness. "feeling like I am drunk..."
- Normal VS
- L beating nystagmus with gaze
- Improved with benzodiazepine Rx
- "If CT is OK, home with meclizine..."

49

**If Motion Symptoms,
Central and Peripheral
Diagnoses Related to
Three Vertigo Types**

50

The screenshot shows a detailed table titled 'Timing-and-Triggers Approach to the Patient With Acute Dizziness'. The table is organized by symptom onset (e.g., sudden, gradual) and includes columns for history, physical exam, differential diagnosis, and management. A red box highlights the 'Sudden onset' row.

51

**Vertigo Types and
Likely Diagnoses**

What diagnoses are to be considered based on the vertigo timing, triggers, and current Sx?

Vertigo Type	Common Diagnoses
Spontaneous	BPPV, Meniere's disease, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Triggered	Meniere's disease, BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Exertional	Meniere's disease, BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Postural	Meniere's disease, BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Positional	BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.

52

**Vertigo Timing, Triggers, Diagnoses:
6 Benign and 4 Serious Causes**

Timing	Triggers	Diagnoses
Sudden	None	BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Gradual	None	Meniere's disease, BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Exertional	None	Meniere's disease, BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Postural	None	Meniere's disease, BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Positional	Yes	BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.
Induced by Head Movement	Yes	BPPV, Migraine-associated vertigo, Vestibular neuritis, Labyrinthitis, MCA stroke, TIA, MS, Vertebral artery dissection, Cervicogenic vertigo, etc.

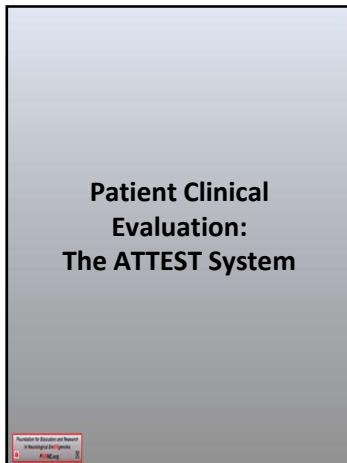
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Clinical Questions Take Home Points

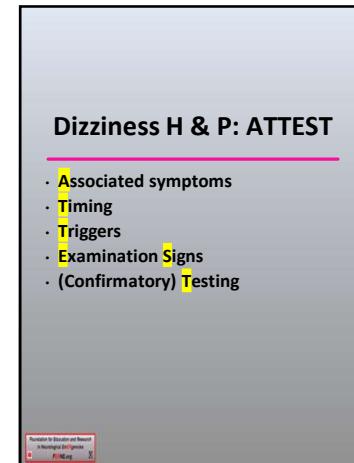
Diagnoses

- Syncope/near syncope? Diagnosis established.
- Unsteady with standing/gait? Cerebellar ischemia?
- Vertigo symptoms? Three types of vertigo:
 - Current, continuous? Acute Vestibular Syndrome (AVS).
 - Spontaneous episodic vertigo (sEVs)
 - Triggered episodic vertigo (tEVs)
- Non-specific dizziness is the diagnosis of exclusion.

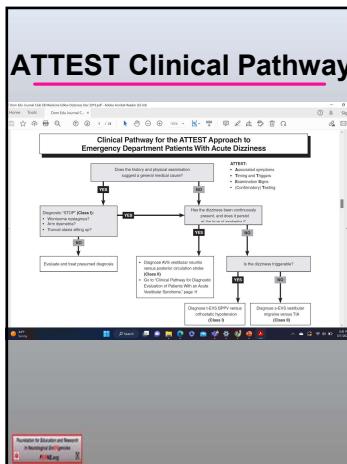
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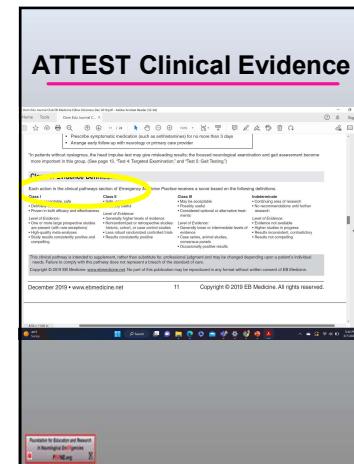
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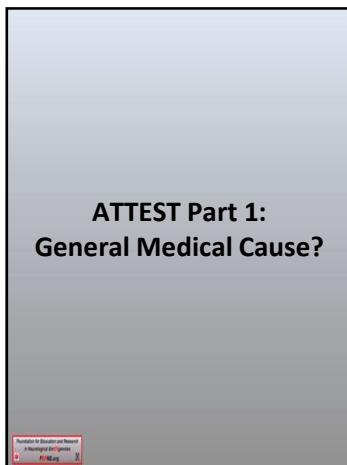
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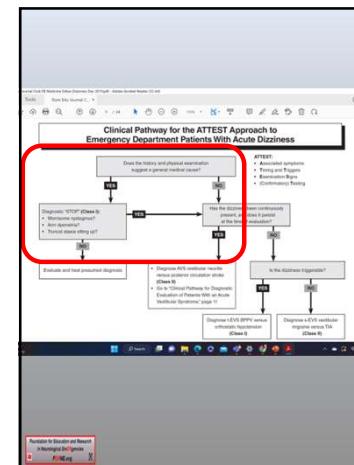
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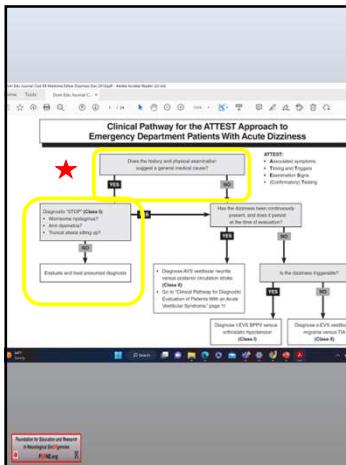
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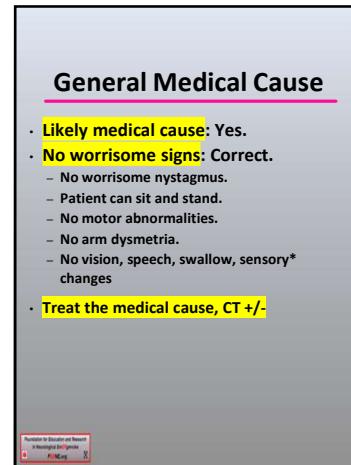
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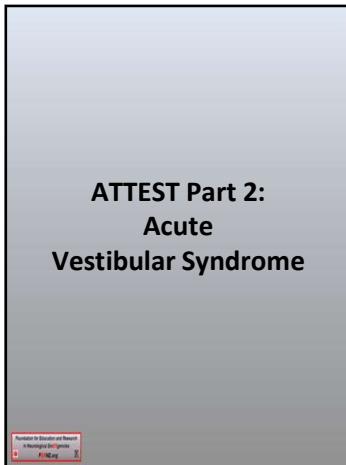
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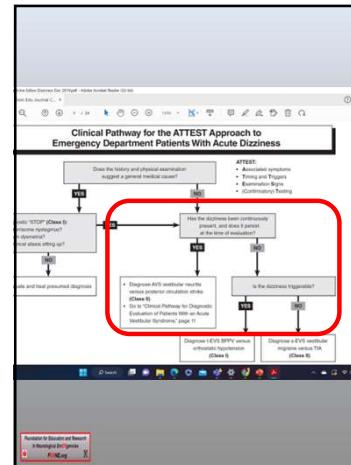
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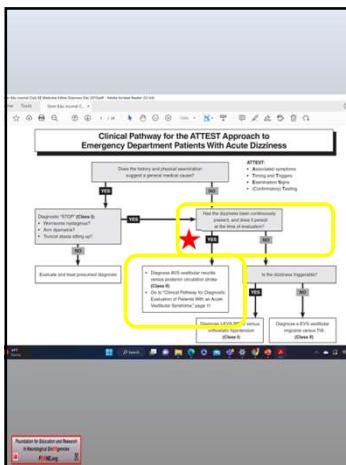
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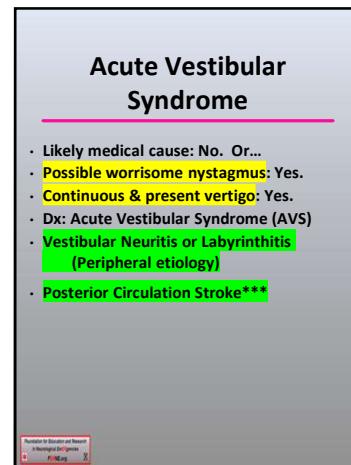
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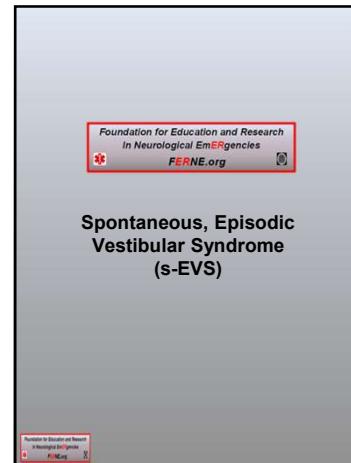
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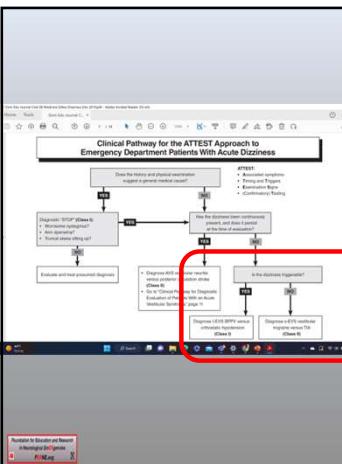
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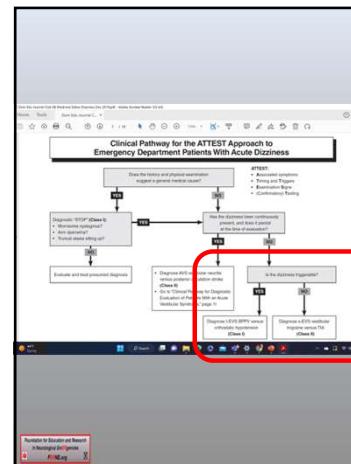
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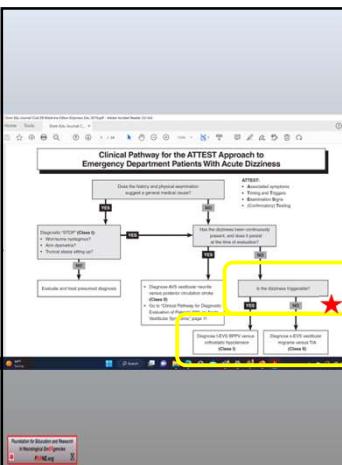
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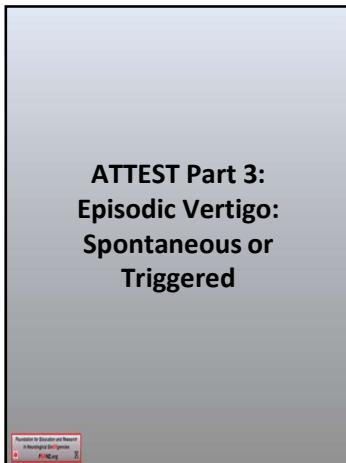


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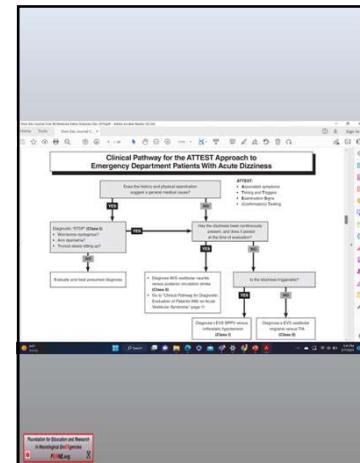
Spontaneous, Episodic Vestibular Syndrome

- Likely medical cause: No. Or...
 - Possible worrisome nystagmus: Yes.
 - Continuous & present vertigo: No.
 - Triggered? Head Mvt, Standing: No
 - Dx: Spontaneous, Episodic Vestibular Syndrome (sEVS)
 - Meniere Dx, Vestibular migraine**
 - Cardiac dysrhythmia**
 - Posterior Circulation TIA*****

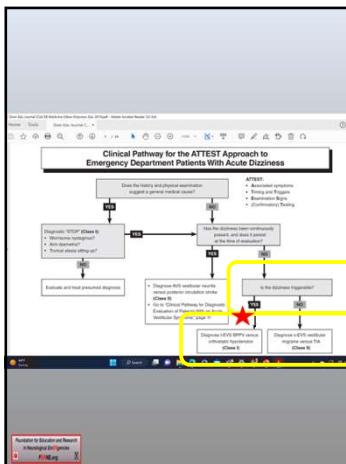
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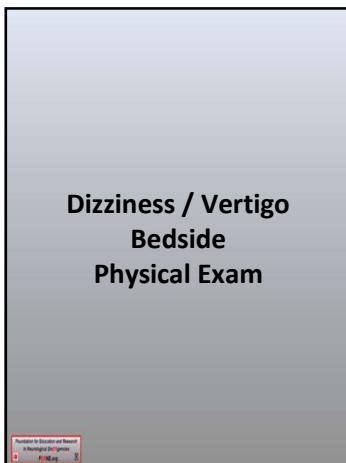


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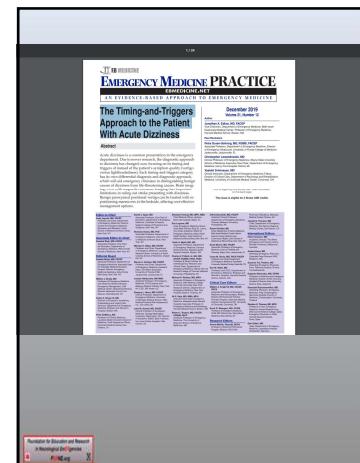
Triggered, Episodic Vestibular Syndrome

- Likely medical cause: No. Or...
- Possible worrisome nystagmus: Yes.
- Continuous & present vertigo: No.
- Triggered? Head Mvmt, Standing: Yes
- DX: Triggered, Episodic Vestibular Syndrome (t-EVS)**
- BPPV (Peripheral)**
- Orthostatic Hypotension (Systemic)**
- Posterior fossa tumor (Central)**

76



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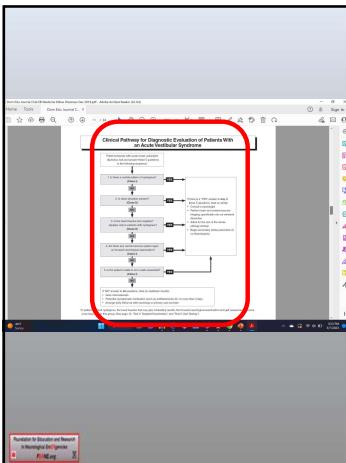
78

Dizzy/Vertigo Patients: Central Etiology?

Edward P Sloan, MD, MPH

Emergencies in Medicine Park City

March 1, 2023

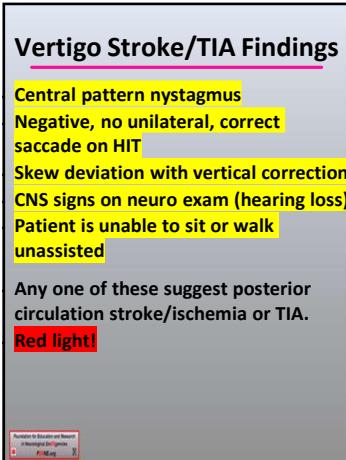


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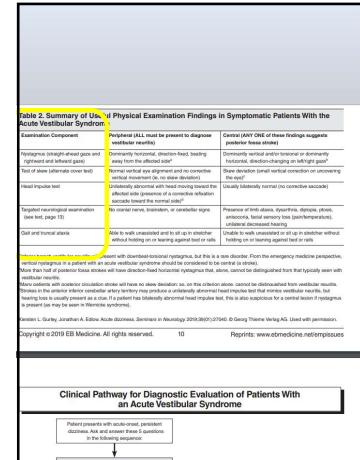
Vertigo Stroke/TIA Findings

- For patients with AVS and s-EVS***
- Five tests are performed with these central Sx:
- Nystagmus exam
- No unilateral HIT exam
- Vertical skew deviation
- Stroke exam signs including new hearing loss
- Ataxia
- If any of these 5 findings are found, posterior circulation stroke or ischemia (TIA) are likely.

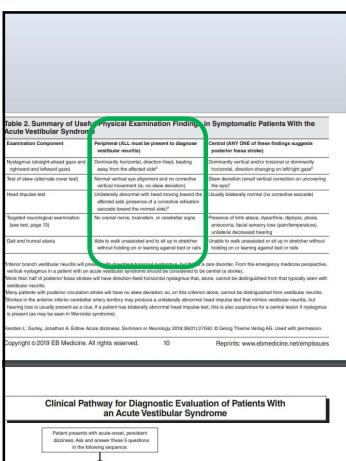
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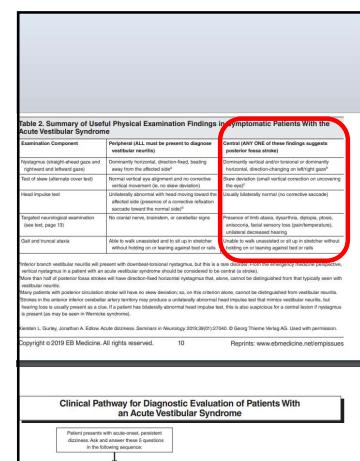
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82



83



84

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Vertigo Patient
Bedside Physical Exam:
Peripheral vs Central
Nystagmus (in AVS)

85

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Nystagmus in AVS: Three Caveats

- 1. Nystagmus exam in this case is related to patients with acute vestibular syndrome (AVS). The nystagmus exam in patients in other clinical settings will vary such that these central vs peripheral tenets may not apply.
- 2. Nystagmus is discussed first in the HINTS exam because the Horizontal Impulse Test exam results only apply in patients with nystagmus.
- 3. If a patient DOES NOT have nystagmus in the setting of profound vertigo and ataxia, a central etiology should be suspected regardless of the HINTS exam.

86

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Nystagmus in AVS: Peripheral vs Central

- Peripheral etiology:**
 - Horizontal nystagmus commonly present
 - One-directional horizontal movement (fast correction in one direction, other side with illness)
- Central etiology:**
 - Horizontal nystagmus absent
 - Vertical or torsional (rotational) nystagmus
 - Bidirectional horizontal fast nystagmus movement
 - (Bidirectional fast correction due to central disease)
 - (Both vestibular system sides not likely sick)

87

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Central Etiology
Nystagmus in AVS

- Central etiology:**
 - Horizontal nystagmus absent
 - Vertical or torsional (rotational) nystagmus
 - Horizontal fast nystagmus correction in both directions c/w central disease (Please see in bottom eyes 2b below.)
 - (Eyes go fast in both directions with change in gaze direction.)

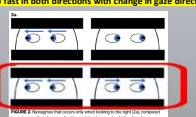


FIGURE 3: Nystagmus that occurs only after looking to the right (2a), compared to nystagmus that occurs in all directions (central disease). AVS = Acute vestibular syndrome.

<https://www.ama-assn.org/ama/resident/article/hints-avss>

88

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Nystagmus in AVS Patients

Central:

- Vertical or torsional (rotary) nystagmus.
- Bidirectional nystagmus.
- No nystagmus noted.

Peripheral:

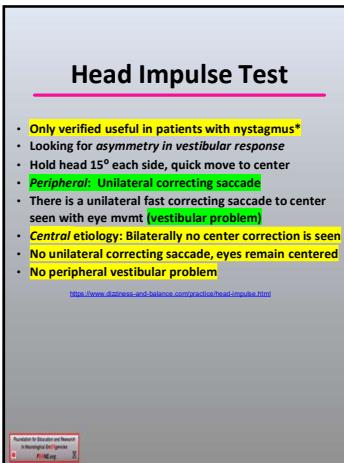
- Unidirectional horizontal fast nystagmus.
- (One vestibular system is sick.)

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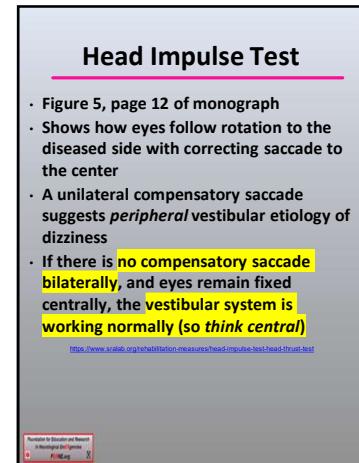
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Vertigo Patient
Bedside Physical Exam:
Peripheral vs Central
Head Impulse Test

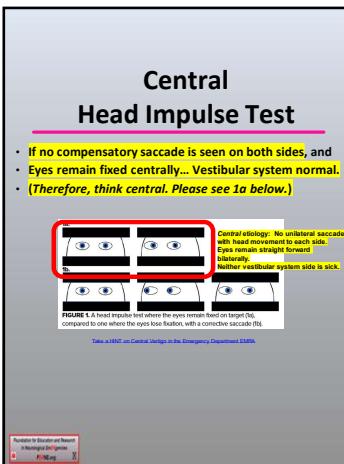
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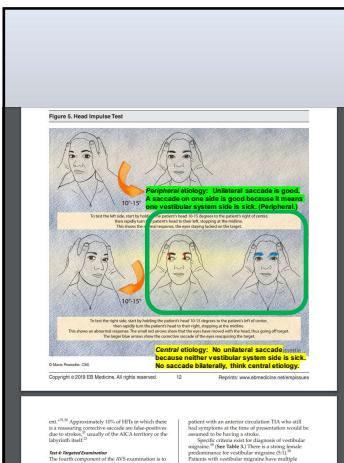
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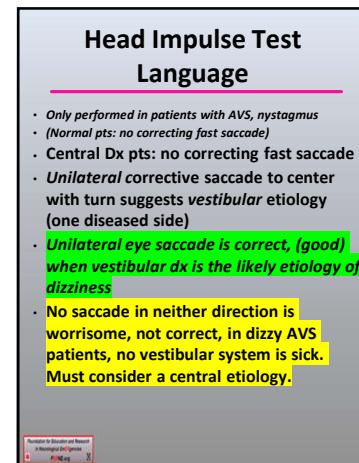
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94



95



96

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Head Impulse Test

Central:

- No saccade means normal vestibular function. Eyes stay midline bilaterally.
- If there is no saccade bilaterally, then both vestibular systems work. (Not sick.)
- The vertigo could be a central etiology!

Peripheral:

- One side has a saccade because one peripheral vestibular system is ill.

97

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Vertigo Patient Bedside Physical Exam: Peripheral vs Central Test of Skew

98

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Test of Skew

- Cover, uncover one eye at a time alternately
- Peripheral etiology:** No vertical skew deviation
- No vertical correction as eye is uncovered
- Central etiology:** Positive skew deviation
- Vertical correction as eye is uncovered to get both pupils to be aligned on vertical axis
- Similar to vertical nystagmus
- Bad finding in AVS patients

99

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Positive (Central) Test of Skew

- Cover, uncover alternating eyes, one eye at a time covered.
- Central etiology:** Positive skew deviation.
- Vertical correction as eye is uncovered to get both pupils to be aligned on vertical axis (See arrow in R eye 3b below.)
- One eye moves vertically to correct pupils.

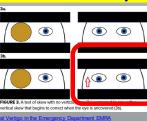


FIGURE 3 A-C: A test of skew with a positive result in a patient with central vertigo. The top row shows the eyes in primary position. The bottom row shows the eyes in a skew position. The arrow indicates the direction of eye movement to align the pupils.

Take a FERNE on Central Vertigo in the Emergency Department. 2020

100

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Test of Skew

Central:

- Pupils are misaligned vertically.
- When one eye is uncovered, there is a vertical correction for pupils to align.

Peripheral:

- Pupils align vertically when either eye is uncovered.
- No vertical misalignment or correction.

101

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Vertigo Patient Bedside Physical Exam: Peripheral vs Central Neurological Exam

102

Neurological Exam Findings

- **Peripheral etiology:** No findings
- No cranial nerve, brainstem, or cerebellar findings
- **Central etiology:**
 - Limb ataxia, dysarthria, **hearing loss***
 - Pain, temperature sensory loss**
 - Diplopia, ptosis, anisocoria, dim vision

103

Neurological Exam

Central Findings:

- CN: Ptosis, unequal pupils, hearing loss
- Brainstem (Posterior Circulation)
 - > **Pain/temp sensory loss**
 - > Dim vision, dysarthria
- Cerebellar: Limb ataxia

Peripheral:

- No CN, brainstem, or cerebellar findings.

104

Vertigo Patient Bedside Physical Exam: Peripheral vs Central Truncal Ataxia & Gait

105

Truncal Ataxia and Ataxic Gait Test

- **Peripheral etiology:** No findings
- Able to sit without holding on, able to walk
- **Central etiology:**
 - Unable to sit without holding on / leaning
 - Unable to walk unassisted
 - Truncal ataxia or ataxic gait

106

Truncal Ataxia & Gait

Central Findings:

- Truncal Ataxia: Leaning when sitting
- Ataxia: Wide-based standing/walking

Peripheral:

- Patient able to sit, stand up, and walk

107

Vertigo Patient Bedside Physical Exam: Peripheral vs Central Negative Big Five HINTS+ (+)

108

HINTS+ (+)
Central Vertigo Signs

- Vertical, torsional, or bilateral fast nystagmus
- Normal HIT bilaterally, eyes remain central, no saccade
- Vertical SKEW correction is seen
- Central neurological findings:
 - Limb ataxia, dysarthria, [hearing loss (HINTS +)]
 - Pain, temperature sensory loss*
 - Diplopia, ptosis, anisocoria, dim vision
- (Truncal ataxia or ataxic gait)
- (Extremity weakness, facial asymmetry, aphasia, AMS)

109

HINTS+ (+) is Physical Exam Testing

HINTS+ (+):

- Nystagmus (Bilat fast, vert, rotation bad)
- Head Impulse (No unilateral saccade bad)
- Test of Skew (Vertical skew bad)
- + Hearing loss (New hearing loss bad)
- (+) Truncal ataxia and gait (Both bad)
- (+) Anterior stroke signs (Any are bad)
- If any of these are found: Red Light!

110

Negative Big 5: HINTS+ (+)

All Clear. Green light to go:

- One side has a saccade because one peripheral vestibular system is ill unilaterally.
- Unidirectional horizontal nystagmus only.
- Pupils are aligned vertically when testing skew.
- No posterior neuro Sxs (hearing loss is HINTS +).
- (Patient able to sit, stand up, and walk.)
- (No anterior stroke Sx: weak, face, speech, AMS.)
- HI N TS + (+)

111

Negative Big 5: HINTS+ (+)

All Clear. Green light to go:

- One side has a saccade because one peripheral vestibular system is ill unilaterally.
- Unidirectional horizontal nystagmus only.
- Pupils are aligned vertically when testing skew.
- No posterior neuro Sxs (hearing loss is HINTS +).
- (Patient able to sit, stand up, and walk.)
- (No anterior stroke Sx: weak, face, speech, AMS.)
- HI N TS + (+)

112

HINTS+ (+) is Physical Exam Testing

HINTS+ (+):

- Nystagmus (Bilat fast, vert, rotation bad)
- Head Impulse (No unilateral saccade bad)
- Test of Skew (Vertical skew bad)
- + Hearing loss (New hearing loss bad)
- (+) Truncal ataxia and gait (Both bad)
- (+) Anterior stroke signs (Any are bad)
- If any of these are found: Red Light!

113

HINTS+ (+) and Peripheral Etiology

To make Vestibular Neuritis Dx in AVS:

- need unilateral fast nystagmus and
- need unilateral saccade on Head Impulse test

- Head impulse must show unilateral correction saccade in order for the diagnosis to be peripheral vestibular neuritis.
- One vestibular system must be malfunctioning and the HI test must show unilateral saccade.
- No unilateral saccade is bad: it means central.

114

**Dizziness / Vertigo,
HINTS Testing & the
Medical Literature:
*FERNE National
Journal Club***

115

**HINTS vs. ABCD2 for
Stroke / TIA**

HINTS plus new hearing loss = highest AUC.

116

**HINTS +, Imaging,
and Disposition**

HINTS +, SEND HIM ON HOME SAFE MNEMONIC.

- S.E.N.D. H.I.M. O.N. H.O.M.E. S.A.F.E.'
- Straight Eyes [no skew];
- No Dearthless [no new hearing loss];
- Head Impulse Misses [unilaterally abnormal];
- One-way Nystagmus [predominantly horizontal, direction fixed in all gaze positions];
- Healthy Otic and Mastoid Exam [pearly tympanic membranes; no pimplies, pus, perforation, or pain on palpation of mastoid];
- Stands Alone [able to stand without holding on to another person or object];
- Face Even [no facial palsy or weakness].

117

**Nystagmus and
Posterior Stroke**

Nystagmus can't be used alone for stroke Dx.

118

Acute Truncal Ataxia and Nystagmus

HINTS plus an exam for truncal ataxia is key.

119

HINTS Testing vs. MRI

HINTS may detect early stroke before MR DWI

HINTS in Diagnose Stroke in the Acute Vertebrobasilar Syndrome

Three-Step bedside Outpatient Examination More Sensitive Than Early MRI

HINTS more sensitive than MRI. Only early after posterior stroke.

120

HINTS and Machine Learning

Machine learning can enhance HINTS test

Can machine learning improve upon the HINTS test, univariate analysis, and logistic regression?

Machine learning can improve accuracy, sensitivity, and specificity of clinical exam testing.

121

HINTS and Machine Learning

Machine learning (purple) enhances HINTS test

HINTS test utility is the yellow line.

Machine learning is purple box plot.

Machine had greater accuracy (A) and AUC (B) than HINTS alone.

122

Dizziness / Vertigo Patient Outcome

123

Dizziness Case: 44 yo Dizzy Male

- Sign out. Just check the CT...
- 44-year-old male, Hx HTN, DM
- Six hours continuous dizziness
- Unsteadiness. "feeling like I am drunk..."
- Normal VS
- L beating nystagmus with gaze, L gaze
- Improved with ED Rx
- "If CT is OK, home with meclizine..."**

124

44 yo Dizzy Male: Is it Central?

- Sign out: Just check the CT...
- CT is neg, but is the patient clear to go?
- Pt with ? decreased auditory acuity L
- Mild wide-based gait c/w ataxia
- Pt admitted, initial MR DWI negative
- Subsequent MR DWI at 72 hours positive for posterior stroke

125

44 yo Dizzy Male: Posterior Stroke

- MR demonstrates posterior stroke

Imaging findings associated with acute basilar artery occlusion in Fig. 1. (A) T2 FLAIR shows a hyperintense infarct (arrow) in the left cerebellar hemisphere. (B) Axial diffusion-weighted MRI (DWI) shows acute right posterior cerebral artery (PCA) territory infarction (arrow), as well as a small area of acute basal ganglia infarction (arrowhead). (C) Axial T2 FLAIR shows a hyperintense infarct (arrow) in the left PCA territory, as well as a small area of acute basal ganglia infarction (arrowhead). (D) Axial diffusion-weighted MRI (DWI) shows acute right posterior cerebral artery (PCA) territory infarction (arrow), as well as a small area of acute basal ganglia infarction (arrowhead).

Right basilar occlusion and posterior stroke findings.

126

**44 yo Dizzy Male:
Posterior Stroke**

Posterior circulation occlusions.

Anatomy of the vertebral and basilar arterial circulation and circle of Willis.

(A) Site of posterior inferior cerebellar artery occlusion
 (B) Site of posterior cerebral artery occlusion
 (C) Site of pontine perforating artery occlusion

Arterial occlusions posteriorly.

127

**44 yo Dizzy Male:
Is it Central?**

- Acute vestibular syndrome (AVS)
- Vertebralbasilar system posterior stroke?
- Posterior circulation tissues
 - Thalamus
 - Brainstem (midbrain, pons, medulla)
 - Occipital lobes
 - Temporal and parietal lobes
- Outcome can be devastating

128

**Posterior Circulation
Stroke**

Posterior Circle of Willis blood flow disruption to brain and brain stem.

Other vertebrobasilar territories: Medial temporal and parietal lobes; A very large area of the brain that includes the occipital lobe, cerebellum, brainstem, and upper cervical spine.

Therapy: Thrombolysis - Posterior circulation stroke is a medical emergency. Recombinant tissue plasminogen activator (rt-PA) is effective in acute stroke.

Diagnosis: History - Posterior circulation stroke is often preceded by transient ischemic attacks (TIAs). Clinical presentation - Vertigo, ataxia, nystagmus, and other cerebellar signs. Headache - Basilar artery occlusion, and posterior circulation stroke can cause headache. Other symptoms - Limb weakness, sensory changes, and altered mental status. Physical exam - Hypotension, bradycardia, and other cerebellar signs.

Correlation: Imaging - Suspect posterior stroke and posterior circulation stroke if there is vertigo, ataxia, nystagmus, and other cerebellar signs.

Fig 2 shows regions supplied by the posterior circulation and typical symptoms of posterior circulation strokes.

129

**Dizziness / Vertigo
EMR Documentation**

130

Dizziness Dot Phrase

Dizziness:

- Diagnosis:** Non-specific dizziness.
- No evidence of syncope or near syncope. No findings c/w vertigo. No motion symptoms noted. No physical exam or test findings demonstrating a systemic cause to the symptoms. Normal CV exam. Neurological exam, including vision, hearing, speech, standing and gait, cerebellar signs, and HINTS testing is normal. Pt not orthostatic. VS normal. EKG and lab testing normal. Able to be discharged safely. Pt aware and agrees with plan for outpatient follow-up. Return prn.

131

Vertigo Dot Phrase

Vertigo:

- Diagnosis:** Acute Vestibular Syndrome (AVS)
- Patient with motion symptoms c/w vertigo.
- Non-specific neurological exam
 - No evidence of syncope or near syncope. Exam OK.
 - Normal ENT and CV exam. No vascular abnormalities noted.
 - Normal neurological exam, including vision, hearing, speech, standing, gait, and cerebellar signs was normal.
 - Pt not orthostatic. VS normal. EKG and lab testing normal.
 - HINTS + exam is equivocal. Diagnostic uncertainty.
 - Admit for further evaluation, including MRI (over time)

132

HINTS + (+) Dot Phrase

- Diagnosis: Acute Vertigo Syndrome (AVS)
- Likely Acute vestibular neuritis
- HINTS +:
 - No vertical, torsional, or bilateral fast nystagmus
 - HIT demonstrates correcting saccade Left, c/w L vestibular system dysfunction
 - No vertical Skew correction
 - No facial or extremity weakness
 - No limb ataxia, dysarthria, speech abnormality, hearing loss*
 - No pain or temperature sensory loss*
 - No diplopia, ptosis, anisocoria, dim vision
 - No truncal ataxia in car and no ataxic gait
 - Able to stand and walk without assistance

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133

HINTS + (+) Dot Phrase

- Diagnosis: Acute Vertigo Syndrome (AVS)
- Likely Acute vestibular neuritis
- HINTS +:
 - Patient well, observed to leave ED without assistance
 - Able to be discharged safely, Pt aware and agrees with plan for outpatient follow-up. Return as needed.
 - Dizziness/vertigo medications as indicated.

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134

Is Vertigo Central?

EMR Plan

- Have neurological exam template
- Have a neuro exam for vertigo patients
- Template the HINTS + (+) exam
- Have dot phrases for decision making
- Be able to document functioning (walk...)
- Have discharge instructions templated
- Know that your documentation will enhance patient outcomes

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Dizziness / Vertigo Summary

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Dizziness / Vertigo Conclusions

- Clear definitions allow for correct diagnoses
- Hx leaves dizziness as **diagnosis of exclusion**
- Syncope and systemic causes can be found
- 3 vertigo types: AVS, s-EVS, or t-EVS
- AVS, can be **posterior stroke**; s-EVS, a **TIA**
- t-EVS, can be possible **posterior lesion**
- Need neuro & HINTS + exams in vertigo pts
- Central signs on HINTS + easy to find, document
- HINTS + more sensitive than CT, MRI in vertigo

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137

Dizziness / Vertigo Recommendations

- Use a reverse Hx with **dizziness** as **Dx of exclusion**
- Use Hx, Px, VS, labs, EKG, O₂ sat for **systemic causes**
- Consider **3 vertigo types**: AVS, s-EVS, or t-EVS
- With AVS, think **posterior stroke**; s-EVS, think **TIA**
- With t-EVS, think **possible posterior lesion**

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Dizziness / Vertigo Recommendations

- Vertigo? Do both neuro exam and HINTS + exams
- Template central signs on neuro, HINTS + exams
- Given CT, MRI less useful acutely, use HINTS + first
- Be ready for new tech that will assist in central vs peripheral etiology assessments for vertigo patients

139

HINTS+ (+) is Physical Exam Testing

HINTS+ (+):

- Head Impulse (No unilateral saccade bad)
- Nystagmus (Bilat fast, vert, rotation bad)
- Test of Skew (Vertical skew bad)
- + Hearing loss (New hearing loss bad)
- (+) Truncal ataxia and gait (Both bad)
- (+) Anterior stroke signs (Any are bad)

If any of these are found: Red Light!

140

Peripheral Must Haves

- Vestibular neuritis or labyrinthitis.
- Peripheral etiology.
- All Clear. Green light to go home with meds:
- Unidirectional horizontal nystagmus only.
- One side has a HI saccade (1 vestibular side is ill).
- Pupils are aligned vertically on skew test.
- No posterior neuro Sx (hearing loss is HINTS -).
- Patient able to sit, stand up, and walk.
- Sensory pain & temp testing OK.
- No anterior stroke Sx: weak, face, speech, AMS.

141

Is Vertigo Central? Take Home Ideas

- Know the ATTEST system, 3 vertigo types
- Know the HINTS + (+) exam
- Exclude anterior stroke Sx, Sx
- Pt can walk, talk, see, hear, feel, swallow
- Observe the patient walking out of the ED
- Document using templates
- Give specific return Sx in D/C instructions

142

Educational Objectives

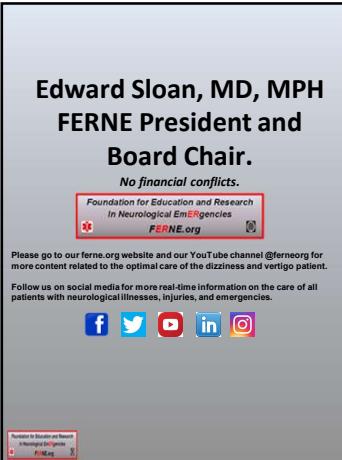
- (1) Enhance understanding of the definitions and pathophysiology of dizziness and vertigo.
- (2) Understand what diagnoses are likely given the type of vertigo the dizzy patient describes.
- (3) Know how to diagnose central causes using the dizzy/vertigo patient physical exam.

143

Educational Objectives

- (4) Specify the exact history and physical exam findings that should be established and documented in the evaluation of ED patients with dizziness and vertigo [ATTEST, HINTS+ (+)].
- (5) Review relevant publications that explain the role of the history, physical exam, neuroimaging, and new technologies in patients with dizziness and vertigo.

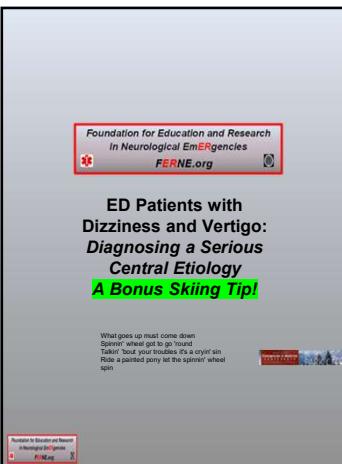
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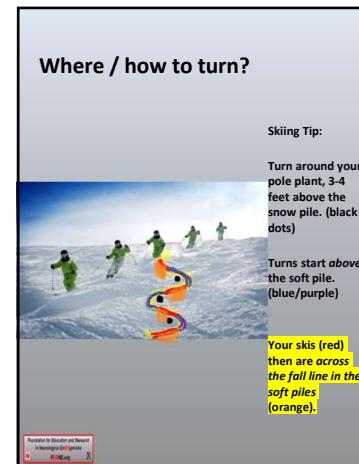
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146



147



148