Evaluation of the Dizzy Patient: History and Physical Examination Pearls

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DIZZEE WORLD
DISCLOSURES

• Speaker’s Bureau, Micromedical Technologies
• Book Royalty, Practical Management of the Dizzy Patient, Lippincott

Learning Objectives

• Describe the elements of a thorough evaluation of the dizzy patient.
• Explain the proper methods to complete the elements of the examination.
• Recognize the significance of the positive and negative findings in the exam.
• Apply methods discussed in this lecture to develop a practical and systematic approach to exam of the dizzy patient.
Anatomy and Physiology

Vestibular Input-Semicircular Canals

- Detect high velocity and frequency angular head accelerations
- Stabilize gaze during impulsive head movements
- Prevent oscillopsia by minimizing retinal slip
Physiologic Nystagmus

Pathologic Nystagmus - Acute
Pathologic Nystagmus-Early Compensation

Pathologic Nystagmus-Partial Compensation

Pathologic Nystagmus-Full Static Compensation
Pathologic Nystagmus-Dynamic Compensation

Vestibular Input-Otolith Organs
- Sense transient linear accelerations and stabilize body position
- Sense gravity and set background muscle tonus
- Contribute to the linear VOR
- Ocular counter rolling
- Ocular skew

Orientation of Otolith Maculae
Otolith-ocular Reflexes

- Linear VOR (LVOR) - linear ocular response to stabilize target on retina during transient linear acceleration in yaw and pitch planes
- Ocular counter roll - torsional ocular response to align the horizon on the retina in response to sustained tilt in the roll plane
- Tilt-induced skew deviation - disconjugate vertical alignment of the eyes to align the horizon on the retina in response to sustained tilt in the roll plane

Visual Inputs

- Optokinetic reflex to sense relative visual movement
- Smooth pursuit to track desired targets
- Saccades to refixate on new targets
Somatosensory Inputs

- Pressure receptors to sense interaction with support surface
- Stretch receptors to sense joint alignment and muscle tension
Central Sensory Integration

• Compare sensory inputs
• Create context-dependent hierarchy
• Generate appropriate command to motor system for posture control

Motor Output

Pyramidal
Extrapyramidal
Multisegmental reflex loops
Musculoskeletal conditioning

Movement Strategies

• Ankle strategy
• Hip strategy
• Step strategy
Summary

- Balance and gaze stability rely on a combination of sensory inputs, central integration and motor output
- The VOR stabilizes gaze during rapid head movement
- The VSR helps stabilize posture during transient linear accelerations or gravity
- Adaptive plasticity and sensory substitution are critical to compensation following vestibular injury

Evaluation of the Dizzy Patient

- History (70%)
- Physical Exam (10-20%)
- Laboratory Tests (10-20%)

How to Obtain the History

- Structured questionnaire mailed to the patient
- Personal interview using the questionnaire as a guide
Key Historical Points

- Presence or absence of vertigo
- Time course of the sensation
- Accompanying symptoms/signs
- Relation to movement/head position

Table III

<table>
<thead>
<tr>
<th>Differentiation of Central From Peripheral Dizziness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peripheral</strong></td>
</tr>
<tr>
<td>Hallucination of movement</td>
</tr>
<tr>
<td>Intensity</td>
</tr>
<tr>
<td>Duration</td>
</tr>
<tr>
<td>Influenced by head position</td>
</tr>
<tr>
<td>Nystagmus</td>
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<tr>
<td>Vestibular symptoms</td>
</tr>
<tr>
<td>Tinnitus</td>
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<tr>
<td>Deafness</td>
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<tr>
<td>Disturbances of consciousness</td>
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<tr>
<td>Other neurological signs</td>
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</tbody>
</table>

The Million Dollar Question

- QUESTION- Do you get dizzy just rolling over in bed?
- ANSWER?
The Million Dollar Question

• QUESTION- Are you light sensitive during your dizzy spell?
• ANSWER?

The Million Dollar Question

• QUESTION- Does one ear feel full before or during your dizzy attack?
• ANSWER?

The Million Dollar Question

• QUESTION- Does a loud sound make you dizzy or make your world jiggle?
• ANSWER?
The Million Dollar Question

• QUESTION- Was your first attack severe vertigo lasting hours with nausea and vomiting?

• ANSWER?

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Percentage of study population with diagnosis</th>
<th>Grouping of symptoms with the highest positive predictive value</th>
<th>Odds Ratio</th>
<th>Positive likelihood ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign Positional Vertigo</td>
<td>24.3%</td>
<td>No dizziness between attacks, positional</td>
<td>11.25</td>
<td>5.659</td>
</tr>
<tr>
<td>Migraine</td>
<td>17.4%</td>
<td>Photophobia, worse in moments of stress, associated headache</td>
<td>21.25</td>
<td>70.4</td>
</tr>
<tr>
<td>Merman</td>
<td>15.2%</td>
<td>Hearing change during attack, vertigo</td>
<td>2.525</td>
<td>6.73</td>
</tr>
<tr>
<td>Vestibular Neuritis</td>
<td>8.1%</td>
<td>Motion sickness, balance, attacks ≥ 20 minutes</td>
<td>2.302</td>
<td>1.848</td>
</tr>
<tr>
<td>Central</td>
<td>7.1%</td>
<td>Constant dizziness, history of depression, vascular instability</td>
<td>3.607</td>
<td>22.72</td>
</tr>
<tr>
<td>Anxiety</td>
<td>5.3%</td>
<td>Movement change during attacks</td>
<td>4.111</td>
<td>2.662</td>
</tr>
<tr>
<td>Cardiac</td>
<td>5.3%</td>
<td>Confusion, history of fall, danger of loss of consciousness</td>
<td>7.564</td>
<td>6.303</td>
</tr>
<tr>
<td>Postural</td>
<td>5.3%</td>
<td>Weakness, dizziness, age ≥ 65 years, difficulty hearing</td>
<td>3.366</td>
<td>3.888</td>
</tr>
<tr>
<td>Bilateral Vestibular Loss</td>
<td>3.3%</td>
<td>Vertigo, headache, difficulty walking in the dark, frequency (once a month)</td>
<td>18.36</td>
<td>15.465</td>
</tr>
<tr>
<td>Unilateral Vestibular Loss</td>
<td>3.3%</td>
<td>Difficulty hearing, vertigo, difficulty walking in the dark, frequency (once a month)</td>
<td>18.36</td>
<td>15.465</td>
</tr>
<tr>
<td>Central</td>
<td>1.9%</td>
<td>Weakness, dizziness, dizziness, weakness, facial weakness</td>
<td>3.607</td>
<td>2.662</td>
</tr>
<tr>
<td>Other</td>
<td>5.9%</td>
<td>N/A</td>
<td>3.607</td>
<td>2.662</td>
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</tbody>
</table>
Predictive Capability of Historical Data for Diagnosis of Dizziness

The Ten Minute Exam of the Dizzy Patient

Components of the Physical Exam
- VOR exam- nystagmus, head impulse, head heave, headshake, dynamic visual acuity, ocular torsion, ocular skew
- VSR exam- tandem Romberg, foam Romberg, step test
- Central OM exam- gaze, pursuit, saccade, fixation suppression
- Posture
- Gait
Spontaneous Nystagmus

- Eyes open versus Frenzel lenses
- Direction-fixed versus changing
- Pendular versus jerk nystagmus
- Saccadic intrusions
Peripheral Left Spontaneous Nystagmus

• VIDEO
### Alexander’s Law

- 1st degree nystagmus - present only in gaze towards fast phase
- 2nd degree nystagmus - present in neutral gaze and stronger in gaze towards fast phase
- 3rd degree nystagmus - present in all gazes, strongest in gaze towards fast phase

### Congenital Nystagmus

- Present since birth/early childhood
- Horizontal direction changing
- Pendular and jerk waveform
- Null point
- Dampens with convergence
Congenital Nystagmus

- VIDEO

Central Downbeat Nystagmus

- VIDEO

Periodic Alternating Nystagmus

VIDEO
Torsional Spontaneous Nystagmus

VIDEO

See-Saw Nystagmus

• VIDEO

Other Forms of Central Spontaneous Nystagmus

• Downbeat
• Upbeat
• See-saw
• Convergence-retraction
• Square wave
• Ocular flutter
• Opsoclonus
Gaze Nystagmus

- Direction changes with direction of gaze
- Exponentially-decreasing waveform
- Sustained

Gaze-Evoked Nystagmus

VIDEO
Left Gaze Evoked Nystagmus

• VIDEO

Forms of Gaze-evoked Nystagmus

• Horizontal in lateral gaze
• Vertical in up or downgaze
• Downbeat in lateral gaze
• Dissociated abducting nystagmus in lateral gaze

Downbeat Nyastagmus on Lateral Gaze
Smooth Pursuit

- Smooth movement
- Best corrected vision
- Horizontal better than vertical

Normal Smooth Pursuit

- VIDEO
Abnormalities of Smooth Pursuit

- Erratic
- Saccadic
- Absent
- Uni- or bi-directional

Saccadic Pursuit

- VIDEO
Optokinetic Reflex

**Characteristics**

- Full field retinal stimulation
- Optimal function with large slow repetitive target motion
- Augments low-frequency VOR signal
- Primitive non-voluntary reflex

Saccades

- Conjugate
- Accurate
- Fast
- Minimal delay
Ocular Dysmetria

VIDEO
Bilateral INO

• VIDEO

Right INO following brainstem CVA

• VIDEO
Saccadic Slowing

- VIDEO

Saccadic Eye Movements

- Saccadic dysmetria (dorsal vermis/fastigial nuclei)
- Post-saccadic drift (flocculus)
- Saccadic slowing (age, medications, brainstem lesions, oculomotor lesions)
- Delayed saccades (age, attention, oculomotor apraxia, Parkinson's Disease)

Fixation suppression

- Rotate chair and observe nystagmus
- Focus on finger moving with patient and observe for nystagmus
- Failure implies flocculus lesion
Head Impulse Test (HIT)

- Move from side to center
- Focus on target
- Look for corrective saccade
- Can be unilateral or bilateral

Stimulus

- Displacement = 20° — 30°
- Peak head velocity = 200°/s — 400°/s
- Peak head acceleration = 2000°/s² — 4000°/s²
Head Impulse Test (HIT)

VIDEO
Headshake Test

- 2 Hz for 20 seconds
- Use Frenzel lenses
- Observe for post headshake nystagmus
- Usually beats towards stronger ear
- Observe for cross-coupling and reversal

**VIDEO**
Dynamic Visual Acuity Test

• Normal- <3 line decrease in acuity during 2 Hz headshake
• Decrease- 3 or more line decrease in acuity
• Aphysiologic- decrease with torsional movement
Ocular Torsion Test

- Move patient’s head slowly in roll plane
- Observe eyes for counter-rolling
- Symmetric, asymmetric, absent
- Implies presence or absence of otolith (utricular) ocular reflex (OOR)

Vestibular Skew Deviation

- Observe eyes for vertical alignment
- Unilateral otolith loss- ipsilateral eye down, contralateral eye up
- May be confused with central skew deviation or strabismus

Position Testing

- Dix-Hallpike test- observe latency, duration, fatigue, direction, reversal
- Static positional- use Frenzel lenses
• Triggered by side-lying or Dix-Hallpike test
• canalithiasis - transient geotropic horizontal (downward ear stronger)
• cupulolithiasis - prolonged ageotropic horizontal (downward ear weaker)
• Treated with log roll or Gufoni maneuver
Anterior Canal BPPN

- Very rare
- Downbeat ageotropic torsional nystagmus (upward ear involved)
- Many cases are posterior canal BPPN with debris on non-ampullated end
- Treatment - modified CRP (true Ant BPPN) or Epley (atypical Post BPPN)

Additional Tests

- Pneumatic otoscopy
- Sound stimulation
- Valsalva
- Hyperventilation
- Mastoid oscillation
Left Superior SSC Dehiscence
Hyperventilation-induced Nystagmus

- Nystagmus induced with vigorous breathing
- Fast phase directed towards diseased ear (irritative)
- Seen in MS and lesions of the VIII nerve
- Recently in post-gamma knife for vestibular schwannoma

**VIDEO**

Limb Testing

- Finger-nose-finger
- Heel-shin
- Rapid alternating motion
- Joint proprioception
- Vibration detection
- Flexibility/strength
Posture and Gait Testing

- Romberg EO/EC
- Romberg EO/EC on foam
- Tandem Romberg
- Step test
- Gait observation
Step Test

• Ask patient to march in place eyes closed for 40-50 steps
• Observe for rotation in yaw plane
• >45 degree deviation - abnormal

Gait Observation

• Path- straight or veering
• Stride- normal, shortened, heel strike
• Base- normal, wide
• Initiation- normal, halting
• Rhythm- normal, ataxic
• Turns- smooth, festinating
Symptoms/Signs of Peripheral Vestibular Disease

- Repeated episodes of vertigo in absence of accompanying neurological complaints
- Spontaneous nystagmus-direction fixed, horizontal rotary, suppressed by fixation, normal OM exam
- Positive HIT, PHN, reduced DVA
- Positive Dix-Hallpike
- Imbalance without ataxia

Symptoms/signs of CNS Disease

- Vertigo/dysequilibrium, incoordination with accompanying CNS complaints and inability to stand unassisted
- Spontaneous nystagmus- vertical, torsional, direction-changing, enhanced with fixation
- Abnormal SP, saccades
- Atypical positioning nystagmus
- Ataxic gait
- Skew deviation
- Absent HIT

Thank You!