Key Elements of the Clinical Exam

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Disclosure: Dr. Hall is faculty for the FallProof™ certification program

Focused assessment
- Identification of problems
- Development of treatment plan
- Need to modify treatment
- Readiness for discharge

Impact of vestibular hypofunction

Subjective complaints
Vision during head movement
Balance in stance
Balance while moving
Functional activities
Reduced quality of life

Key items in the history

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Tempo</th>
<th>Symptoms</th>
<th>Circumstances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vestibular neuritis</td>
<td>Acute dizziness</td>
<td>Vertigo, disequilibrium, N&amp;V, oscillopsia</td>
<td>Spontaneous, exacerbated by head movement</td>
</tr>
<tr>
<td>Labyrinthitis</td>
<td>Acute dizziness</td>
<td>Vertigo, disequilibrium, N&amp;V, oscillopsia, hearing loss, tinnitus</td>
<td>Spontaneous, exacerbated by head movement</td>
</tr>
<tr>
<td>Wallenberg’s infarct</td>
<td>Acute dizziness</td>
<td>Vertigo, oscillopsia, disequilibrium, N&amp;V, tilt, lateropulsion, ataxia</td>
<td>Spontaneous, exacerbated by head movement</td>
</tr>
<tr>
<td>Bilateral or chronic unilateral vestibular</td>
<td>Chronic dizziness</td>
<td>Dizzy, disequilibrium, oscillopsia</td>
<td>Head movement, walking, Exacerbated in dark; uneven surface</td>
</tr>
<tr>
<td>Anxiety/depression</td>
<td>Chronic dizziness</td>
<td>Lightheadedness, floating, or rocking</td>
<td>Induced by eye movements with head still</td>
</tr>
</tbody>
</table>

Key items continued

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Tempo</th>
<th>Symptoms</th>
<th>Circumstances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign paroxysmal positional vertigo</td>
<td>Spells: seconds</td>
<td>Vertigo, lightheadedness, nausea</td>
<td>Positional: rolling over in bed, bending down, looking up</td>
</tr>
<tr>
<td>Orthostatic hypotension</td>
<td>Spells: seconds</td>
<td>Lightheadedness</td>
<td>Positional: standing up</td>
</tr>
<tr>
<td>Migraine</td>
<td>Spells: minutes</td>
<td>Vertigo, dizziness, motion sickness</td>
<td>Usually movement induced</td>
</tr>
<tr>
<td>Motion sickness</td>
<td>Spells: hours</td>
<td>Nausea, diaphoresis, dizziness</td>
<td>Movement induced, usually visual-vestibular mismatch</td>
</tr>
<tr>
<td>Meniere’s disease</td>
<td>Spells: hours</td>
<td>Vertigo, disequilibrium, ear fullness, change in hearing, tinnitus</td>
<td>Spontaneous, exacerbated by head movement</td>
</tr>
</tbody>
</table>
History: Elements that help develop goals

- **Subjective complaints**
  - list of symptoms
  - Intensity of complaints
  - Visual analog scale

- **Impact on ADL's and functional activities**
- **Perceived disability**
- **Fall history**
- **Balance related confidence**

Subjective complaints

- **List of symptoms**
  - Imbalance
  - Sense of movement of environment or self
  - Sensations not associated with motion of environment (e.g., lightheadedness, rocking, swimming, fear of public places)
  - Associated symptoms (e.g., sweating, nausea, vomiting)
  - Impaired vision (e.g., double vision, blurred vision, jumping of vision when walking or in moving car)

Imbalance:

- **Is it**
  - Spontaneous
  - Induced by movement
  - Induced by position

- **Is it worse**
  - With fatigue
  - Outside
  - In the dark
  - On uneven surfaces

Impact on activities

- **Percent of time dizziness interferes with or prevents activities**
- **ADL’s**
- **Driving**
- **Working**
- **Disability**

Fall history

- **Description:** where, when, activity preceding, distractions, dizzy?
- **How often and most recent fall?**
- **Injuries?**

Subjective complaints

- **Need to quantify subjective symptoms**
  - Establish priorities
  - Show change
  - Internal consistency

- **There are MANY tools**

  - **Choose ones that address various issues:**
    - Symptoms
    - Perceived disability
    - Confidence
    - Interference with activities
    - Psychological problems that may interfere with recovery (depression, anxiety)
Intense of Subjective complaints

- Visual analog scale
  - Based on pain scales
  - 10-cm line either end anchored with word descriptions
  - Disequilibrium, oscillopsia and head movement
  - Expressed as difference score between baseline (sitting) and walking or after head movement
  - Modest reliability ($r = 0.59 - 0.65$; Hall et al., 2004; Herdman et al., 2000)

Visual analog scale

Please place a mark on the line below corresponding to how dizzy you feel right now as you are sitting.

As bad as it can be

No dizziness at all

HM VAS = 5.5/10

Visual analog scale

Please place a mark on the line below corresponding to how dizzy you feel right now after one minute of horizontal head movement at 1 Hz.

As bad as it can be

No dizziness at all

HM VAS = 7.4/10

Multidimensional Dizziness Inventory (Hazlett et al., 1996)

- Developed based on pain questionnaire
- Multiple components
  - Percent of time dizziness interferes with daily activities; Activity level
  - PANAS
  - Anxiety if N > 29.9
  - Depression if P < 22
- Millon Behavioral Medicine Diagnostic™
  - Identifies problems in more detail
  - Coping styles
  - Compliance issues

In the last 6 months, what percentage of the time has dizziness interfered with your activities?

Mark line

Modified: In the last week, what percentage of the time has dizziness interfered with your activities?

Mark line

Reliability: ICC = 1.00 (Hall & Herdman, 2006)
Modified: In the last week, what percentage of the time has dizziness prevented your activities?

Mark line

| 0% | 20% | 40% | 60% | 80% | 100% |

**Perceived disability**

<table>
<thead>
<tr>
<th>Disability scale (Shepard et al '90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - Negligible symptoms</td>
</tr>
<tr>
<td>1 - Bothersome symptoms</td>
</tr>
<tr>
<td>2 - Performs usual work but symptoms interfere w/ outside activities</td>
</tr>
<tr>
<td>3 - Symptoms disrupt work and outside activities</td>
</tr>
<tr>
<td>4 - Currently on medical leave or had to change jobs</td>
</tr>
<tr>
<td>5 - Unable to work for &gt; 1 year/ permanent disability</td>
</tr>
</tbody>
</table>

- Valid and reliable (r = .97; Hall et al., 2004)
- Scores of 4 or 5 correlated with poor outcome

**Balance-related confidence**

Activities-specific balance confidence scale (ABC)

(Powell, 1995)

- “How confident are you that you will not lose your balance or become unsteady when you…”
- Tasks of varying difficulty
  - Walking around house to walking on ice
- <80% average correlated with reduced activity
  (Myers et al., 1998)
- Moderate correlation (r = -.635) with Dizziness Handicap Inventory (DHI) in individuals with vestibular deficits

**Dizziness Handicap Inventory**

- One of the most commonly used questionnaires
- Assesses perceived disability, emotional/physical/functional, across a variety of activities due to dizziness (Jacobson & Newman, 1990)
- “yes” response = 4 points, “sometimes” = 2 points, and “no”, = 0 points.
- Scores range from 0 (no handicap) to 100 (significant handicap)
  - 0–30 indicates mild, 31–60 moderate, and 61–100 severe handicap (Whitney et al. 2004)
- Excellent reliability for total score (r = .97)

**Vestibular Rehabilitation Benefits Questionnaire (VRBQ)**

(Morris, Lutman and Yardley, 2009)

- Developed from interviews with patients in vestibular rehabilitation
  - Addresses aspects of dizziness symptoms and impact described by patients
- Subscale structure identified by factor analysis
- Validated against established questionnaires in longitudinal study

**VRBQ**

- Construct validity verified relative to DHI, Vertigo Symptom Scale (VSS) and SF-36.
- Subscales of VRBQ show excellent internal consistency and test-retest reliability (ICC = 0.92 - 0.99).
- Preliminary data indicate that VRBQ is more responsive to change than DHI and VSS.
Management of the Patient with Vestibular Hypofunction or Loss

**Clinically meaningful change†**

<table>
<thead>
<tr>
<th>Summary Scores</th>
<th>Total Quality of Life</th>
<th>Symptoms Dizziness</th>
<th>Symptoms Anxiety</th>
<th>Symptoms Motion-provoked Dizziness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7%</td>
<td>9%</td>
<td>6%</td>
<td>13%</td>
</tr>
</tbody>
</table>

† Minimum clinically meaningful change: mean change score (24-hour reliability) + 2SD

**Baseline Symptoms**

1. Sit to supine
2. Supine to left side
3. Supine to right side
4. Supine to sit
5. Left Hallpike-Dix
6. Up from left
7. Right Hallpike-Dix
8. Up from right
9. Sitting, head to left knee
10. Head up from left knee
11. Sitting, head to right knee
12. Head up from right knee
13. Sitting head turns (5 x)
14. Sitting head pitches (5 x)
15. In stance, 180° turn left
16. In stance, 180° turn right

**Intensity:**

- 0
- 1
- 2
- 3
- 4
- 5

**Duration:**

- 5-10 s = 1
- 11-30 s = 2
- >30 s = 3

**MSQ = (Intensity + Duration) x No. of positions**

20.48

**Mild:** 0 – 10; **Moderate:** 11 – 30; **Severe:** 31 – 100

**Motion Sensitivity Quotient (MSQ; Shepard & Telian)**

- 16 rapid changes in head position
  - Includes sit to supine, Hallpike-Dix, head tipped, head turns, 180° turns
  - Does NOT include visual stimulation

**Symptoms recorded:**

- Intensity (0 – 5)
- Duration
- Number of positions that provoke symptoms

**Physical exam**

- Pathology:
  - Acute UVH or brainstem/cerebellum abnormality
  - Brainstem/ cerebellar abnormality
  - Chronic vestibular hypofunction
  - Usually BPPV. Rarely, central positional vertigo, perilymphatic fistula, hypermobile stapes.

- Use Frenzel lenses or infrared goggles?
  - yes
  - no

**Spontaneous vestibular nystagmus**

Static defect: decreased input from SCC

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**Key Elements of the Oculomotor Exam**

<table>
<thead>
<tr>
<th>Physical exam</th>
<th>Pathology</th>
<th>Use Frenzel lenses or infrared goggles?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous nystagmus</td>
<td>Acute UVH or brainstem/cerebellum abnormality</td>
<td>yes</td>
</tr>
<tr>
<td>Visual tracking and saccades</td>
<td>Brainstem/ cerebellar abnormality</td>
<td>no</td>
</tr>
<tr>
<td>Assess vestibulo-ocular reflex (VOR): Head thrust test Head-shaking nystagmus Dynamic visual acuity</td>
<td>Chronic vestibular hypofunction</td>
<td>no yes no</td>
</tr>
<tr>
<td>Eye movements and vertigo elicited during positional testing</td>
<td>Usually BPPV. Rarely, central positional vertigo, perilymphatic fistula, hypermobile stapes.</td>
<td>yes</td>
</tr>
</tbody>
</table>
Peripheral versus Central vestibular nystagmus

<table>
<thead>
<tr>
<th>Feature</th>
<th>Peripheral vestibular nystagmus</th>
<th>Central vestibular nystagmus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of fixation</td>
<td>Nystagmus decreases</td>
<td>Nystagmus either does not change or it increases</td>
</tr>
<tr>
<td>Direction of nystagmus</td>
<td>Usually mixed plane (primarily horizontal and slight torsional)</td>
<td>Usually single-plane horizontal, torsional or vertical</td>
</tr>
<tr>
<td>Effect of gaze</td>
<td>Nystagmus increases with gaze toward the direction of the quick phase</td>
<td>Nystagmus either does not change or reverses direction</td>
</tr>
</tbody>
</table>

Nystagmus is named for the direction of the quick phase
- Slow-phase eye velocity is driven by vestibular system; quick phase is a central reset
- Follows Alexander’s law: increases in the direction of the quick phase
  - 1st, 2nd, 3rd degree nystagmus depending on the number of gaze positions with nystagmus

Dynamic defect: decreased VOR

Test Procedure Results
--- | --- | ---
Head thrust Thrust the head as patient fixes a target Refixation saccade indicates vestibular defect
Head-shaking nystagmus Oscillate the head 20 times > 2 beats of nystagmus suggests vestibular asymmetry
Dynamic visual acuity Patient reads lowest visible line on ETDRS chart during 2 Hz head oscillation > 2 line decrement indicates vestibular deficit

Head-shaking nystagmus
- Abnormal if > 2 beats of nystagmus
- Due to asymmetrical VOR
- Intact velocity storage system
Clinical dynamic visual acuity

- Assess static visual acuity first
- Then dynamic visual acuity with head oscillations at 2 Hz
- DVA is the difference between static and dynamic
- > 3 lines difference is abnormal

Key elements of the postural exam

- Static balance
  - Modified CTSIB (includes Romberg)
  - Single leg stance
  - Compare to age-reference values

- Dynamic balance
  - Weight shifting-voluntary limits of stability
    (functional reach/ multidirectional reach)
  - Not always done

M-CTSIB

- 3 trials (30 s/trial)
- If time is 30 s for a given trial, no additional testing required
- Maximum total score possible is 360 s
- CTSIB in Romberg correlated with SOT score (Wrisley et al., 2004)

Functional Reach Protocol

Key elements of the postural exam

- Gait (6th vital sign)
  - Descriptive
  - Gait speed
  - Fall risk while walking: dynamic gait index (DGI) or functional gait assessment (FGA)
    - Elements that stress vestibular system: change in speed, head turns, pivot turn
    - Elements that are predictable vs unpredictable

(Fritz & Lusardi, JGPT, 2009)
Suggested method for 10-m walk test

(Fritz & Lusardi, JGPT, 2009)

Dynamic Gait Index

- Assesses ability to modify balance while walking in the presence of external demands (Shumway-Cook Gruber, et al., 1997; Shumway-Cook, Baldwin, et al., 1997)
- Excellent interrater and test-retest reliability (0.96–0.98)
- Scoring is based on a 4-point scale from 0 to 3
  - 0 = severe impairment
  - 3 = normal ability
- Scores of ≤ 19 indicate risk for falling
  - Vestibular patients with score ≤ 19 were 2.58 times more likely to fall (Whitney et al., 2000)

DGI: Short-form

- Clinical properties of DGI–4 comparable to DGI–8 (Marchetti & Whitney, 2006)
  - Excellent internal consistency and discriminative ability
  - No equipment required
- DGI–4: gait on level surfaces (DGI 1), change in speed (DGI 2), horizontal (DGI 3) and vertical head turns (DGI 4)
- Score of ≤ 9/12 on DGI–4 indicates fall risk

Functional Gait Assessment

- Modification of DGI with higher level gait tasks
  - 7 of original items (modified) plus 3 new items
  - Walking with head turns self-paced
  - Walking tandem, with eyes closed, backwards (Wrisley et al., 2004)
- Good interrater and intrarater reliability (ICC = 0.83–0.84)
  - Validated in vestibular patients
- ≤ 22/30 indicates fall risk in OA (Wrisley, 2010)
- Published age-norms (Walker et al., PTJ, 2007)

Goals

- Reduce subjective symptoms by 75%
- Reduce fall risk as measured by DGI
- Normalize use of sensory input as measured by SOT
- Able to see clearly with head movement as indicated by DVA
- Independent HEP

Summary

- Diagnosis
- Impression
- Problem list
- Goals
- Plan