Dizziness in the Older Adult
Part II: Vestibular Assessment and Rehabilitation

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Outline

- Introduction to the Vestibular System
- Common Etiologies of Dizziness
- Assessment of the Vestibular System
- Interpretation of Results
- Candidates for Vestibular Rehab
- Overview of Vestibular Rehab
- Treatment by Diagnoses
- Compensation and Outcomes to Vestibular Rehab
- Introduction to Case Studies

Statistics

- Approximately 7 million people see their physician per year for problems with balance and dizziness.
- 30% of the population will report problems with balance and dizziness before age 65.
- An estimated 45% of dizziness can be attributed to a vestibular disorder
- RISK FOR FALLS:
  - 25-35% of individuals aged 65-75 years old
  - 32-42% of individuals over 75 years old
  - Leading cause of death for those greater than 65 years of age.
Introduction to the Vestibular System

Otolith Organs
- Gravity
- Linear Acceleration

Semicircular Canals
- Angular Acceleration
- Shaking our Head “NO”
- Detects direction and speed

Vestibulo-ocular Reflex (VOR)

Vestibulo-ocular Reflex (VOR)

Introduction to the Vestibular System
- Unsteadiness
- Light headedness
- Imbalance
- “I’m Spinning!!”

Duration
- 30 seconds
- 30 minutes
- 30 hours
- 30 days???
Case History

• Vestibular
  – Sudden Onset
  – Room Spinning Dizziness
  – < 24 hours
  – Auditory Complaints

• Central
  – Gradual onset
  – Symptoms last 24/7
  – Include other symptoms such as
    - Diplopia (Double vision)
    - Dysarthria (difficult speaking)
    - Dysphagia (Difficulty swallowing)

Common Etiologies of Dizziness

Peripheral
• BPPV
• Migraine
• Meniere's disease
• Disequilibrium of aging
• Labyrinthitis
• Vestibular Neuritis

Low frequency hearing loss
Room spinning dizziness
Aural Fullness
Buzzing tinnitus
True room spinning dizziness
Hearing Loss (labyrinthitis)

So, when do you refer??

Examinations at BTNRH

• Videonystagmography (VNG)
• Rotary Chair
• Posturography
• Vestibular Evoked Myogenic Potential (VEMP)

What is the purpose of vestibular testing??

- AUDIGRAM!!
- VNG / ENG
- CASE HISTORY!!
- Bedside exam for postural control
- Bilateral Caloric weakness
- Tubes
- Perforation
- Malformed Canal
- CTSIB abnormal
- Major c/o unsteadiness
- Known or suggested pathology involving postural control pathways
- Conductive hearing loss not of middle ear origin

Rotary Chair
Posturography
VEMP
Vestibular Testing

- Are symptoms central in nature?
- Does the patient have BPPV?
- Are symptoms vestibular in nature?
- Does the patient need to see another professional?

Videonystagmography: VNG

- Videonystagmography vs Electronystagmography
- Means for monitoring eye movements
  - Looking for:
    - Head Shake
    - Hyperventilation
    - ETC

Nystagmus

- Deflection up = rightward movements
- Deflection down = leftward movements

Left Beat: 41 degrees per second
Right Beat: 14 degrees per second

VNG: Ocular Motor: Saccade

- The ability to rapidly move the eyes and refixate on a target
  - Latency: how long does it take to find the target
  - Accuracy: how accurate are you?
  - Velocity: how long does it take your eyes to get there?

Videonystagmography: VNG

- Ocular Motor Exam
  - Saccade
  - Pursuit
  - Gaze
  - Optokinetic

- Positional Testing
- Caloric Testing
- Dix-Hallpike
- Other:
  - Head Shake
  - Hyperventilation
  - ETC

Ocular Motor: Smooth Pursuit

- Smooth pursuit: ability to track
- Our ability to perform smooth pursuit arises from vestibulo-cerebellum

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How is Gaze Testing Completed?

- Patient looks at a visual target:
  - Center position
  - Right
  - Left
  - Up
  - Down
- Take away Vision (close the goggles)
  - Center, right, left

Gaze Stability (Fixation)

Peripheral Origin
- Acute Lesion
- Direction fixed
  - Enhanced with Fixation removed
- Linear Slow component
- Alexander’s Law

Central Origin
- Acute or Chronic
- Direction fixed or changing
- Rarely in primary
  - Enhanced with Fixation present
- Decreasing speed of Slow Component

VNG: Positional Testing

- Monitor eye movements
  - Supine
  - Right Side
  - Left Side
  - Head Hanging
  - Head Right
  - Head Left

Dix Hallpike Maneuver

- Used to diagnosed BPPV
- What is BPPV?

What is BPPV?

- Symptoms: symptoms of room spinning dizziness when changing position of the head:
  - Top Shelf
  - Rolling over in bed
  - Lying down in bed
  - Bending over
  - Dentist visits
  - Hair Appointments

Diagnosing BPPV

- Characteristics:
  - Onset 1-10 seconds after movement
  - Symptoms last < 1 minute
  - Rotational eye movements which reverse upon sitting
  - Symptoms fatigue when repeat.
What is BPPV?

• #1 cause of dizziness in individuals over age 50.
• RARE in children
• Commonly follows head injury
• Often associated with other vestibular system insults
• AGE

Dix Hallpike Maneuver

• A: Dix Hallpike Right
  – Patient is seated with head turned 45 degrees to the right
  – Gently lie down with head dropping slightly below level of the shoulders
  – Monitor eye movements for 1 min.
• B. Dix Hallpike Left
  – Patient is seated with head turned 45 degrees to the left
  – Gently lie down with head dropping slightly below level of

Diagnosing BPPV

<table>
<thead>
<tr>
<th>Posterior/ Anterior Semicircular Canal BPPV</th>
<th>Right Torsion</th>
<th>Left Torsion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up Beat</td>
<td>Right Posterior Canal</td>
<td>Left Posterior Canal</td>
</tr>
<tr>
<td>Down Beat</td>
<td>Right Anterior Canal</td>
<td>Left Anterior Canal</td>
</tr>
</tbody>
</table>

Horizontal Semicircular Canal BPPV Diagnosed by: Roll Test

<table>
<thead>
<tr>
<th>Head Right</th>
<th>Head Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canalolithiasis (geotropic)</td>
<td>Pure Horizontal Right Beat</td>
</tr>
<tr>
<td>Cupulolithiasis (ageotropic)</td>
<td>Pure Horizontal Left Beat</td>
</tr>
</tbody>
</table>

VNG: Caloric Testing

• This test is completed by delivering water irrigations to one ear at a time using either warm or cool water.
• Changes the temperature of the fluid within the vestibular system causing a change in pressure.
• This is the only exam that investigates one vestibular system at a time

VNG: Caloric Testing

• The patient lies flat and water is delivered to one ear for 30 seconds.
• Eye movements are then monitored afterward.
• Direction of eye movement is dictated by the temperature of water
• Pneumonic: COWS
  – Cold Opposite / Warm Same
Rotary Chair

- Additional Exam of Peripheral Vestibular System
  - Ear Canal Malformations
  - Tubes
  - Kids
  - Adults

Posturography

- Functional Assessment: Not a Diagnosis
  - Vision
  - Vestibular
  - Somatosensory

Who is a candidate for VBRT?

- Symptoms vs Common Disorders
- Symptoms
  - Complaint of falls
  - Head motion provoked symptoms
  - Uncompensated
- Common Disorders
  - BPPV
  - Uncompensated stable lesion
  - Dysequilibrium of aging
  - Mild anxiety
  - Bilateral peripheral vestibular

Vestibular Rehabilitation Goals

Exercise approach addressing motion sensitivity and postural stability
- To decrease vertigo intensity or symptoms
- To improve gaze stabilization and endurance to movement
- To improve postural stability on multiple surfaces and visual situations
- To improve overall function in multiple environments

Systems for Motion Sensitivity

- Vestibular
- Vision

Systems for Postural Stability

- Vestibular
- Vision
- Somatosensory
Diagnoses

Peripheral Vestibular Deficits
- Unilateral
- Bilateral
- Fluctuating
- Benign Paroxysmal Positional Vertigo (BPPV)

Central Deficits
- Vascular ischemia
- Diffuse damage
- Demyelinating disease
- Tumors
- Migraine

Exam - History
- Dizziness Handicap Inventory (DHI)
- Activities Specific Balance Confidence Scale (ABCs)
- Clear description of dizziness
- Identify any vestibular suppressant meds
- Activity level
- Home environment

Exam – System Screen
- Cardiopulmonary
- Musculoskeletal
- Neurological
- Vestibular
**Systems Screen - Cardiopulmonary**

- Differential diagnosis for lightheadedness
- Vertebral-basilar insufficiency

**Systems Screen - Musculoskeletal**

- Range of Motion
- Muscle Strength
- Pain
- Posture
  - Structural alignment and center of pressure
  - Muscle imbalance

**Systems Screen - Neurological**

- Tactile and kinesthetic sensations
- Sensory organization
- Motor control strategies
- Postural Stability
  - Static
  - Dynamic (balance tests and LOS)

**EquiTest (NeuroCom International)**

1. Normal vision. Fixed support.
2. Absent vision. Fixed support.
5. Absent vision. Sway-referenced support.
6. Sway-referenced vision & support.
Clinical Test of Sensory Interaction in Balance (CTSIB)

Normal

Foam

Normal

Blindfold

Dome

Systems Screen - Vestibular

- Nystagmus check
- Oculomotor tracking
- Head Shake and head thrust
- Motion Sensitivity Test (MSQ)
- Dynamic visual acuity
- Dix-Hallpike