Evaluation, Diagnosis
and Triage/Treatment of
Balance Disorders

**WHAT IS “BALANCE”?**
The ability to control the
Center-of-Gravity
over the
Base of Support
in a given
Sensory
Environment

**CENTER OF GRAVITY**
An imaginary point in space
about which the sum of the
forces & moments equals zero.
Equilibrium
**BASE OF SUPPORT**

The body surfaces which experience pressure as a result of body weight and gravity (*and the area between them!*).

**LIMITS OF STABILITY**

The furthest distance in any direction a person can lean away from midline (vertical) without altering the original base-of-support (*by stepping, reaching,*).

**SENSORY ENVIRONMENT**

The conditions which exist (*or are perceived to exist*) in the real world around us which impact balance.
BALANCE DISORDERS

- Aging
- Stroke
- Head Injuries
- Infection
- Meniere’s disease
- Ototoxic reaction to food, drug, environment
- Orthopedic Problems
- Degenerative central nervous system disorders

Impact of Chronic Mobility Disorders

- 80% of Medical Expenditures
- Prevalence Increases with Population Age
- Unresolved Cases Lead To:
  - “Doctor Shopping”
  - Extensive Diagnostic Testing
  - Fear, Restriction, & Further Deterioration

Mobility Disorders in the Elderly

- Most Frequent Cause of Chronic Disability
- 25-50% Fall Annually
  - 6% Cause Fractures
- 550,000 Strokes/Yr.
  - Majority Have Reduced Mobility
**Customized Treatment Phases**

- Diagnostic Assessment
  - Identify Pathology
  - Quantify Functional Impairments
- Treatment Planning
  - Treat Pathology Where Appropriate
  - Select Patients Appropriate for Rehab
  - Set Treatment Goals
- Rehabilitation
  - Focus on Selected Impairments
  - Monitor Progress Relative To Goals

**Management Critical Pathways**

**Diagnosing “Dizziness”**

- Most important diagnostic tool is HISTORY
- Second most important diagnostic tool is HISTORY
- Physical exam and balance testing are used to qualitatively and quantitatively assess dizziness AFTER a good history is taken
DEFINITIONS

- VERTIGO – hallucination of movement
- ATAXIA - inability to coordinate voluntary muscular movements
- DISEQUILIBRIUM – inability to maintain balance
- SYNCOPE – loss of consciousness
- DIZZINESS – non-medical term encompassing all of the above

Quick Differential Diagnosis

- True vertigo is predominantly peripheral end-organ
- Ataxia and disequilibrium most likely central
- Syncope is NEVER vestibular
- Lightheadedness can be any of above or metabolic

ORGANIZATION OF THE VESTIBULAR SYSTEM

- sensory central processing motor output

- Visual Vestibular Proprioceptive
- Primary Processor (Vestibular Nuclear Complex)
- Adaptive Processor (Cerebellum)
- Motor Neurons
PERIPHERAL Vestibular System
- Semicircular Canals
- Otoliths
- 8th Nerve
- Labyrinth
- Hair Cells

NEURAL INTEGRATOR
- Converts end organ signals to respond to changes in head position
- Located in the brainstem

VESTIBULO-SPINAL REFLEX
- VSR stabilizes the body
- No one VSR
- Assembly of several reflexes dependent on sensory and motor context
VOR (vestibulo-ocular reflex)

- Head movements
- Endolymph (fluid in semicircular canals)
- Hair cells
- 8th Cranial Nerve
- Vestibular Nuclei
- Oculomotor System: VOR (eyes move in the opposite direction of head motion)

CENTRAL Vestibular System

- Brainstem
- Cerebellum
- Vestibulo Ocular Reflex (VOR)
  - Allows clear vision during locomotion

DIZZINESS HISTORY

- Description of dizziness (vertigo, lightheaded, floating, ataxia)
- Description of first episode
- Duration of sx (seconds, minutes, hours, days)
- Frequency (daily, weekly, sporadic)
DIZZINESS HISTORY
(cont’d)

- Aura
- Associated sx's: tinnitus, hearing loss, nausea and/or vomiting, neurological sx's
- Loss of consciousness

Dizziness: Duration & Frequency

- Seconds: BPPV
- Minutes: TIA or Migraine
- Hours: Peripheral Vestibular
- Constant: CNS, peripheral, migraine

Symptoms: Vestibular Pathology

- Dizzy with upright activities
- Dizzy with rapid head/eye motion
- Dizzy with specific head position
- Visual disturbance
- Debilitating vertigo
- Nausea or anxiety with busy stimuli
- Vertigo after heavy lifting/pressure change
- Anxiety/Panic
Symptoms: CNS Pathology

- Dizziness w/o specific activity
- Dizziness w/o specific position
- Ataxic gait
- Decreased righting reaction
- Lightheadedness
- Nausea or vomiting rare
Symptoms: Vascular Pathology

- Blacking out/fainting
- Positive vertebral artery test
- Numbness/tingling in limbs

Symptoms: Somatosensory Pathology

- Difficulty walking on altered surfaces
- Burning sensation in feet
- Poor tactile sensation
- Tripping and falling

WHAT IS THE?
Most Common Causes of Dizziness

- BENIGN POSITIONAL VERTIGO
- VESTIBULAR NEURITIS
- VESTIBULAR MIGRAINE, CERVICAL VERTIGO
- TIA of Labyrinthine circulation

- MENIERE’S DISEASE is NOT a common cause of vertigo

BPPV (Cupulolithiasis)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Predisposing factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>True vertigo lasting up to 60 seconds</td>
<td>Age (&gt; 60yrs)</td>
</tr>
<tr>
<td>Positional</td>
<td>Head or neck trauma</td>
</tr>
<tr>
<td>Usually self-limited</td>
<td>Inactivity</td>
</tr>
<tr>
<td></td>
<td>Chronic ear disease</td>
</tr>
</tbody>
</table>

VESTIBULAR NEURITIS (Labryinthitis)

- Severe vertigo with N&V lasting a week or more
- Residual imbalance up to 6 weeks
- Hearing not involved
- Usually follows URI
VESTIBULAR MIGRAINE

- True vertigo, rocking sensation, "sea-sick" feeling
- May or may not have aura
- Can last minutes, hours or days
- Almost always occurs in persons with hx of migraine headache

CERVICAL VERTIGO

- Dizziness associated with neck movement
- Vascular compression from arthritis, surgery, chiropractic manipulation
- Abnormal sensory input from neck proprioceptors
- Usually history of whiplash or other neck injury

TIA

- Can have identical sxs of vestibular neuritis
- Suspect in at-risk populations (DM, HTN, previous TIA)
MENIERE’S DISEASE
(Endolymphatic Hydrops)

- Severe vertigo lasting hours
- Fluctuating SNHL
- Pressure and/or roaring in ear
- Balance usually normal between episodes

BILATERAL VESTIBULAR DISORDERS

- Extremely rare
- Usually from ototoxic drugs
- Oscillopsia and/or ataxia more common than vertigo
- Less than optimal results with therapy

CLINICAL EXAMINATION

- Head & Neck Exam
  - especially EAR and EYE movement
- Complete Neurological Exam
  - especially posture & equilibrium
    - Romberg
    - Tandem
    - Sharpened tandem
    - Hallpike if indicated
TREATMENTS

- BENIGN POSITIONAL VERTIGO
  - Repositioning maneuver
- VESTIBULAR NEURITIS
  - Anti-emetics no longer than one week, VOR exercises
- VESTIBULAR MIGRAINE
  - Treat as you would a regular migraine
- CERVICAL VERTIGO
  - Physical therapy
- TIA of Labyrinthine circulation
  - Physical therapy

Candidates For Rehabilitation

- Stable Uncompensated Unilateral Losses
- Moderate/Severe Bilateral Losses
- Head Trauma With Persistent Symptoms
- Abnormal Sensory & Movement Strategies
- Risk For Falling/Multifactorial Problems

CENTRAL vs PERIPHERAL VERTIGO
EquiTest and VAT Diagnostic Role

- Select Patients for Rehabilitation
- Focus Rehab on Impaired Components
- Identify Psychogenic Overlay
- Help Predict Surgical Outcomes
- Objective Results Documentation & Quality Control

Thank You