Vertigo, Dizziness, and Disorders of Equilibrium

By

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Vestibulocochlear – 8th Cranial N

2 parts:

Cochlear subserves hearing or acoustic function and
Vestibular concerned with equilibrium/balance and orientation of the body and eyes to surrounding world
Acoustic division

Cell bodies in spiral ganglion of cochlea

Peripheral process’ of bipolar cells of ganglion convey auditory impulses to the inner ear—the spiral organ of Corti. This is the end organ of hearing wherein sound is transduced into nerve impulses
The organ of Corti consists of 15,000 neuroepithelial (hair) cells
• The semicircular ducts, utricle, and saccule contain the sense organs for the detection of angular and linear acceleration. They are filled with intracellular fluid, endolymph, and surrounded by CSF (perilymph).
Central fibers from spiral and vestibular ganglia unite in a common trunk, enter the cranium thru internal auditory meatus, (with the facial and intermediate nerves). They traverse the cerebellopontine angle and enter the brainstem at the level of the pons and medulla.
• 28 million Americans have a significant degree of deafness.
• 2 million are profoundly deaf
• 1/3rd older than 75 are handicapped by hearing loss (1989)
• Otosclerosis is main cause of deafness in early adult life (conduction loss).
• Other causes- cerumen, atresia, thickened tympanic membrane from infection or trauma and obstruction of Eustachian tubes
• Sensorineural deafness (aka nerve deafness)—dz of the cochlea division of 8th CN. Presbycusis (age related hearing loss) is most common cause—hi frequency

• Central deafness is caused by lesions of cochlear nuclei and central connections to temporal lobe
Postural control

Volition, Feed forward control

CNS integration

Motor command

Biomechanics external constraints

movements

Info

Vision

Vestibular info

Proproception

Skin - Touch

Info
Physiologic mechanisms of balance

• Visual impulses
• Labyrinthine impulses-angular and linear acceleration. Vestibuloocular and vestibulospinal reflexes.
• Proprioceptors of the joints and muscles are essential to all reflex, postural, and volitional movements
Oscillopsia

• An illusory movement of the environment is an effect of vestibular disorder especially if induced by head movement
Dizziness

• What does Pt. mean by it
• History
• Neurovascular exam
• ENG
• Hearing Tests
Benign Paroxysmal Positional Vertigo
BPPV

• recurrent episodes of vertigo lasting for seconds precipitated by changes in head position
• Spontaneous resolution weeks-months
• Recurrence is common
• Hallpike Maneuver to induce sx and nystagmus
• Epley Maneuver for treatment
Meniere Disease

- Episodic attacks of vertigo, tinnitus, and hearing loss
- Aural fullness or pressure
- May present initially with 2 of 3 sx
- Vertigo lasts minutes-hours
Meniere Disease cont’d

• Associated sx of N/V, cold sweats, pallor, diarrhea
• Movement exacerbates sx
• Unilateral in majority of pt’s.
Meniere Disease Cont’d

• causes: trauma, infection, immune-mediated disorders and genetic predisposition

• There is an increase in the endolymphatic fluid pressure and volume (aka Endolymphatic Hydrops)
Vestibular Neuronitis

• Sudden and severe vertigo with n/v lasting a few days prefer to remain motionless
• PE-nystagmus and inability to maintain balance
• Thought to be viral inflammation of Vestibular n. or Labyrinth
Perilymphatic Fistula

• Abnormal communication between perilymph-filled inner ear and air-filled middle ear

• Causes: head trauma, barotrauma, spontaneous from coughing, sneezing, straining, or lifting (increased CSF pressure
Labyrinthine Concussion

• Follows head trauma with or without temporal bone fracture. Vertigo and imbalance are immediate
• Resolves 6-12 months
Whiplash injury

• Dizziness is one of most frequent complaints after TBI
• Resolves weeks-months
Tumors

• Vertigo, CN palsy, ataxia, hearing loss, increased ICP.
• Think of C-P angle
• Do Corneal Reflex
• MRI
Other causes

• Migraine
• Hypothyroidism
• Anemia
• Orthostatic hypotension
• Cardiac dysrhythmia or failure
• Carotid sinus syncope
Other causes cont’d

• Diabetes mellitus
• Hypoglycemia
• Psychophysiologic disorders
• Medication side effects
Treatment

• Bed rest
• Vestibular suppressants—Meclizine, Lorazepam, Diazepam, Promethazine, Prochlorperazine
Figure 21.2 Flowchart for approach to a falling patient.

**Legend**
- ALS: amyotrophic lateral sclerosis (Lou Gehrig’s disease)
- BPPV: benign paroxysmal positional vertigo
- MND: multiple sclerosis
- PLS: primary lateral sclerosis
- TIA: transient ischemic attack
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Falls
FALLS

• *Definition*: coming to rest inadvertently on the ground or at a lower level

• One of the most common geriatric syndromes

• Most falls are not associated with syncope

• Falls literature usually excludes falls associated with loss of consciousness
MORBIDITY AND MORTALITY

• Most falls by older adults result in some injury

• 10%–15% of falls by older adults result in fracture or other serious injury

• The death rate attributable to falls increases with age

• Mortality highest in white men aged ≥85: 180 deaths/100,000 population
CAUSES OF FALLS
BY OLDER ADULTS

• Rarely due to a single cause

• May be due to the accumulated effect of impairments in multiple domains (similar to other geriatric syndromes)

• Complex interaction of:
  ➢ Intrinsic factors (eg, chronic disease)
  ➢ Challenges to postural control (eg, changing position)
  ➢ Mediating factors (eg, risk taking, underlying mobility level)
CAUSES: INTRINSIC

• Age-related decline
  ➢ Changes in visual function
  ➢ Proprioceptive system, vestibular system

• Chronic disease
  ➢ Parkinson’s disease
  ➢ Osteoarthritis
  ➢ Cognitive impairment

• Acute illness

• Medication use *(see next slide)*
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FALLS ASSESSMENT

• Ask all older adults about falls in past year

• Single fall: check for balance or gait disturbance

• Recurrent falls or gait or balance disturbance:
  ➢ Obtain relevant medical history, physical exam, cognitive and functional assessment
CAUSES: MEDICATION USE

• Specific classes, for example:
  ➢ Benzodiazepines
  ➢ Other sedatives
  ➢ Antidepressants
  ➢ Antipsychotic drugs
  ➢ Cardiac medications
  ➢ Hypoglycemic agents

• Recent medication dosage adjustments

• Total number of medications
FACTORS AFFECTING FALLS RISK

- History of falls
- Medications
- Visual acuity
- Gait, balance, and mobility
- Muscle strength
PHYSICAL EXAMINATION

• Blood pressure and pulse, both supine and standing
• Vision screening
• Cardiovascular exam
• Musculoskeletal exam
• Neurologic exam
GAIT AND BALANCE EVALUATION

- Romberg test
- One-legged stance for ≥30 seconds, eyes open
- Tandem gait task for 10 feet
- Mental status exam (eg, Mini-Cog)
- Timed Up and Go test
- Berg Balance Test
- Performance Oriented Mobility Assessment (POMA)
- Functional reach
- Appropriateness of footwear
AGS FALLS PREVENTION GUIDELINES

• Assessment of all older adults and anyone with history of falls

• Multifactorial interventions including:
  ➢ Minimize medications
  ➢ Initiate individually tailored exercise program
  ➢ Treat vision impairment
  ➢ Manage postural hypotension, and heart rate and rhythm abnormalities
  ➢ Supplement vitamin D
  ➢ Manage foot and footwear problems
  ➢ Modify the home environment
CASE 1 (1 of 3)

• A 75-year-old woman is brought to the office by her daughter. The mother has been falling, most often when rising from the toilet or attempting to climb stairs.

• History includes sarcopenia and frailty. She has no neurologic or metabolic abnormalities.

• Exercise was recommended at a previous office visit. Despite the daughter’s efforts, the patient is reluctant to spend time and energy on the exercise program.

• The daughter asks for help prioritizing the exercises. In particular, she wants to know which exercises are most important in preventing falls.
Which of the following is most effective for preventing falls?

A. Strengthening exercise
B. Aerobic exercise
C. Balance exercise
D. Multicomponent exercise
CASE 2 (1 of 3)

• An 85-year-old man comes to the office because he has fallen 3 times in the past 6 months.

• None of the falls involved dizziness or fainting. One fall occurred while he was walking in his yard; in the other instances, he tripped inside his house.

• History includes hypertension without postural changes, gout, osteoarthritis, and depression.

• He takes 5 medications on a regular basis.
Which of his medications is most likely to contribute to his risk of falls?

A. Acetaminophen
B. Allopurinol
C. Hydrochlorothiazide
D. Lisinopril
E. Paroxetine
CASE 3 (1 of 3)

• A 70-year-old woman comes to the office for a routine visit.

• History includes hypertension and osteoarthritis.

• She mentions that last month she tripped on a high curb and fell after parking her car.

• She has had no other falls.
Which of the following is the most appropriate initial step for evaluating her risk of future falls?

A. Test visual acuity.
B. Measure blood pressure for postural changes.
C. Evaluate gait and balance.
D. Ask about environmental hazards in her home.
E. Examine her feet and footwear.
CASE 3 (3 of 3)

Which of the following is the most appropriate initial step for evaluating her risk of future falls?

A. Test visual acuity.
B. Measure blood pressure for postural changes.
C. Evaluate gait and balance.
D. Ask about environmental hazards in her home.
E. Examine her feet and footwear.