### The differential process

**A. Four steps in the differential diagnostic process**

1. Create a list of possible or potential diagnoses that fit the history
2. Determine if the patient is appropriate for therapy
3. Differentiate central from peripheral, consider cervicogenic dizziness

**B. Possible causes of dizziness: organize using a mnemonic TIM VaDeTuCoNe (with example diagnoses)**

1. **T**rauma: TBI, cervicogenic dizziness; fistula, BPPV
2. **I**nflammation, Septic or Aseptic: labyrinthitis, neuronitis, otitis media, sinus infections
3. **M**etabolic: medication side effects, toxin exposure
4. **V**ascular: VBI; orthostatic hypertension, atrial fibrillation
5. **D**egenerative: BPPV; TMJ
6. **T**umor: acoustic neuroma; brain tumor
7. **C**ongenital: fistula
8. **N**eurogenic: psychiatric disorders (Anxiety); migraines, MS, TIA, phobic postural vertigo

**C. Step 2: determine if appropriate: red flags**

1. Benign causes of dizziness
   - a) Vertigo or vomiting combined with (+) hallpike
     - i. 85% PPV, 7.6 +LR
   - b) Age ≤69, (-) neuro deficits, and/or vertigo
     - i. 88% NPV, -LR 0.3 for serious pathology
2. Serious (refer for workshop)
   a) Age >69, (+) neuro deficits, and/or NO vertigo
      i. 40% PPV, +LR 1.5 for serious pathology
3. Signs of systemic diseases, infections processes. Vascular causes
4. Central nervous system: new onset or undiagnosed; changing neurologic status
5. Headache? Unremitting, severe, first time
6. Head is not firmly attached to neck: ligamentous instability
7. Fractures ruled out
8. Vestibular disorders not appropriate for therapy: undiagnosed central causes
9. Peripheral causes
10. Tumor: acoustic neuroma; fistula
11. Yellow flags (proceed with caution): psychiatric: anxiety disorders
D. Step 3: differentiate between central and peripheral vestibular disorders
   1. Central:
      a) originate in the CNS: MS, CVA, TIA, migraines, brain tumors
      b) Nystagmus: at rest, vertical, gaze-evoked; abnormal oculomotor tests (smooth pursuit, saccades, VOR cancellation); signs of CNS disorders, e.g., UMN signs
   2. Peripheral:
      a) Benign paroxysmal peripheral vertigo (BPPV), labyrinthitis, acoustic neuronitis, Menière’s disease, ototoxic vestibular loss, acoustic neuroma, perilymph fistula
      b) No resting nystagmus (unless acute); position/movement provoked; good smooth pursuit; no UMN signs; positive passive head shake, head thrust, dynamic visual acuity
E. Step 4: if it isn’t central or peripheral, consider cervicogenic dizziness
   1. Cervicogenic dizziness is a diagnosis of exclusion
II. Postural control: mechanisms of balance, origins of impairments, common diagnoses
   A. Five components to maintaining postural control: all must be evaluated
      1. Input: vestibular, vision, somatosensory
      2. Afferent pathways
3. Processing: CNS determines body position, selects and coordinates motor response

4. Efferent pathways

5. Output: musculoskeletal system

B. Common vestibular system pathologies

1. Benign paroxysmal peripheral vertigo (BPPV)
   a) Short spells of sudden onset dizziness, caused by otoconia trapped in the semicircular canals. Provoking factors: change of position.

2. Menière’s disease
   a) Recurrent episodes of vertigo, hearing loss, tinnitus or aural fullness, caused by increased volume of endolymph. Time course: hours. Provoking factors: spontaneous. Repeated episodes differentiates from acute vestibular loss.

3. Labyrinthitis
   a) Acute onset of vertigo, tinnitus; caused by infection (viral) of labyrinth. Time course: hours.
      i. Provoking factors: spontaneous onset; changes in head position.

4. Ototoxic vestibular loss
   a) Side effects of certain medications (gentamicin) causes bilateral loss of labyrinth function. If equally affected, no complaint of dizziness, but loss of balance. Provoking factors: eyes closed, dark environment

C. Vestibular ocular reflex (VOR): coordinates head and eye movements to stabilize image on the retina despite head movements. Abnormal VOR suggests a problem in the vestibular system

Interactive Questions – slide 88 @ 100 minutes

III. Imbalance in the elderly

A. Falling is not an inevitable consequence of aging

B. Multifactorial risks for falling
   1. Postural hypotension
   2. Use of sedatives
   3. Use of at least four prescription medications
   4. Impairment in
      a) Arm or leg strength or range of motion
      b) Balance
      c) Transfer skills: bed chair, bathtub toilet
      d) Gait

C. It is possible to reduce the incidence of falls by intervening in the individual risk factors
D. Best tests for predicting the risk of falls
   1. Timed up and go: sensitivity 87%, specificity 87%. >14 seconds predicts 90% of fallers
   2. Functional reach: unable to reach 8x increased risk of falling; 0-6 inches 4x increased risk; 6-10 inches 2x increased risk; over 10 inches unlikely to fall
   3. Dynamic gait index (DGI): score <19 is 2.6 times more likely to fall

4. E. Clinical test for sensory integration and balance (CTSIB): uses 6 sensory conditions to selectively test ability to use vision, vestibular and somatosensory information
   1. Advantages: which system(s) work well? Which system(s) are impaired? Under what functional conditions is the patient at risk? Provides direction for treatment. Screening tool to suggest further work-up. Portable.
   2. Computerized dynamic posturography (CDP): high tech version of CTSIB

F. 5 questions to assess risk: 4 of 5 yes means high risk of falls; 3 of 5 yes means moderate risk
   1. Previous fall last year
   2. On more than four medications
   3. History or current stroke or Parkinson’s disease
   4. Unconfident in balance
   5. Unable to rise from chair without using arms

Interactive Questions – slide 119 @ 138 minutes
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