Welcome to Dizziness and Diseases of the Ear

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Agenda

1. What is Dizziness?
2. Common Non-Ear Causes
3. Middle Ear Disorders linked to Dizziness
4. Inner Ear Disorders linked to Dizziness
5. Q&A (enter your questions in the Question Box any time)

Balance Mechanism

Balance is achieved via:
- Eyes (send information about where your body is in space)
- Inner Ear (sends information about gravity and back-and-forth motion)
- Proprioceptors (sensory nerves that send information about body movements and positions)

What is Dizziness?

- Vertigo
- Light headedness
- Disequilibrium
- Anxiety

What is Vertigo?

Vertigo is a false sense that your surroundings are spinning or moving. This is typically because your brain is sensing signals from the inner ear that aren’t consistent with what your eyes and sensory nerves are receiving.
What is Light Headedness

Light headedness is the feeling that you are about to faint. It is commonly felt by standing up too quickly or by breathing deeply enough times to generate the feeling.

What is Disequilibrium

Disequilibrium is a problem with walking—people feel unsteady on their feet or like they are going to fall down.

What is Anxiety?

Anxiety is when people are scared, worried or depressed. People will sometimes use the word “dizzy” to describe this general feeling of not feeling well or being in control of their lives.

Non-Ear Causes

- Drop in blood pressure
- Cervical spondylosis (arthritis in the neck that puts pressure on the spinal cord)
- Cerebellum Disorders (tumors)
- Diabetes
- Poor Circulation

- Neurological Conditions (Parkinson’s and Multiple Sclerosis)
- Mediations (anti-seizure drugs, anti-depressants, sedatives and tranquilizers) blood pressure medications
- Anxiety disorders
- Low Iron Levels (anemia)
- Low Blood Sugar (Hypoglycemia)
- Overheating and dehydration

The Middle Ear
AOM/OME

- **Otitis media** is a group of inflammatory diseases of the middle ear might be acute or chronic.
- Can often cause temporary dizziness.

Eustachian Tube

Connects the front wall of the middle ear with the nasopharynx and opens to equalize pressure in the ME.

Otosclerosis

- **General Info:**
  - Develops most frequently between ages of 10 and 30.
  - Otosclerosis is autosomic dominate
  - About 10–15% of patients have unilateral loss.
  - Affects women more frequently than men by a ratio of 2:1.
  - Pregnancy once thought to be a risk factor for the development and / or worsening of otosclerosis...recent studies have disputed this.
  - May progress to nerve deafness called cochlear otosclerosis.
- **Test results:**
  - May see Schwartze's sign (red or bluish tm
  - Tympt: A or As
  - Audio-conductive loss with 2k Carhardt notch

Otosclerosis - Case

- Patient reported tinnitus for 5 years
- History of familial otosclerosis but had OM for much of the 5 years
- Previous audios not available to review
- Patient is 11 at time of this audio

Otosclerosis – Case

- Patient had positive Schwartz’s sign
- CT scan consistent with otospongiosis
- Surgery (stapendectomy) and hearing aid were given as options.
- Patient choose to monitor

Cholesteatoma

Cholesteatoma is a destructive and expanding growth in the middle ear and/or mastoid process.
Inner Ear-Vestibular System

- Linear motion
- Rotary motion

Enlarged Vestibular Aqueduct

- Malformation about 5th week of gestation. Hearing loss can be conductive, mixed or sensorineural, and the loss may be stable or fluctuating.
- Often genetic (the SLC26A4 gene). Pendred syndrome & branchiootorenal syndrome most commonly associated with EVA.

BPPV-Benign Paroxysmal Positioning Vertigo

Benign paroxysmal positional vertigo occurs when some of the calcium carbonate crystals (otoconia) that are normally embedded in gel in the utricle become dislodged and migrate into one or more of the 3 fluid-filled semicircular canals, where they are not supposed to be. When enough of these particles accumulate in one of the canals they interfere with the normal fluid movement that these canals use to sense head motion, causing the inner ear to send false signals to the brain.

Meniere’s Disease

- Ménière’s disease is a chronic, incurable vestibular disorder. It’s characterized by sudden episodes of vertigo lasting as long as several hours. Other symptoms include fluctuating hearing loss, ringing in the ear and the feeling of a plugged ear.
- Triggers include stress, overwork, fatigue, emotional distress, additional illnesses, pressure changes, certain foods, and too much salt in the diet.

MD-Case

- Nine year old girl who had been dizzy every other week since age 4. No auditory issues or headache.
- Patient treated for BPPV. Didn’t resolve so given diuretics which decreased the dizziness.
- Based on history only, given diagnosis of MD.
MD-Case

- Eight months later dizziness returned and this time hearing loss was demonstrated.
- Following use of diuretics hearing returned to pre-medicated levels.

Patient now uses diuretics daily and has not had dizziness for past 17 months.

Endolymphatic Hydrops

Hydrops may be either primary or secondary. Primary idiopathic endolymphatic hydrops (known as Ménière's disease) occurs for no known reason. Secondary endolymphatic hydrops appears to occur in response to an event or underlying condition: head trauma or ear surgery, and it can occur with other inner ear disorders, allergies, or systemic disorders (such as diabetes or autoimmune disorders).

Labryinthitis/Vestibular Neuritis

Vestibular neuritis and labyrinthitis are disorders resulting from an infection that inflames the inner ear or the nerves connecting the inner ear to the brain. This inflammation disrupts the transmission of sensory information from the ear to the brain. Vertigo, dizziness, and difficulties with balance, vision, or hearing may result. Infections of the inner ear are usually viral; less commonly, the cause is bacterial.

Autoimmune Disorders

Autoimmune inner ear disease (AIED) is an inflammatory condition of the inner ear (typically hearing but can attack the vestibular system as well). It occurs when the body's immune system attacks cells in the inner ear that are mistaken for a virus or bacteria. AIED is a rare disease occurring in less than one percent of the 28 million Americans with a hearing loss. Some autoimmune disorders that can affect the ear include:

- Cogan's syndrome
- Relapsing polychondritis
- Polyarteritis nodosa
- Wegener's granulomatosis
- Systemic lupus erythematosus
- Ulcerative colitis
- Sjogren's syndrome
- Rheumatoid arthritis.

Autoimmune Inner Ear Disease

About 50% of patients with AIED have symptoms related to balance (dizziness or unsteadiness).
AIED-Case

- Patient a young athlete who had a sudden HL following an upper respiratory infection.
- She had oral herpes at the time of visit.
- Patient was started on high dose steroids.
- Tests for rheumatoid arthritis, inner ear antigens all normal.

Six Months Later

- Audios were done at 1 month w/o change.
- This audio at 6 months: no improvement
- Patient had an MRI which was normal and no evidence of multiple sclerosis or a lesion
- Told to come back in 6 months or if there was a change

14 Months Later

- Patient noticed a sudden drop on the left
- Patient given HA info but choose to not get amplification
- Patient given round of high dose steroids w/o any improvement

3 Months Later

- Patient noticed a drop in hearing and roaring tinnitus on the left side
- Offered a treatment of cytotoxic meds but declined treatment

3 Months + Later

- Tinnitus has gone away
- Hearing continues to fluctuate by 10-15 dB (word rec now 12%)
- HA trial unsuccessful

Perilymph Fistula

- PLF is an abnormal connection (a tear or defect) in one or both of the oval/round windows that separate the air filled middle ear and the fluid filled perilymphatic space of the inner ear. This small opening allows perilymph (fluid) to leak into the middle ear.
- Changes in air pressure that occur in the middle ear directly affects the inner ear, stimulating the balance and/or hearing structures within and causing PLF symptoms.
PF-Case

• Patient has sudden onset of HL with tinnitus and imbalance while weight lifting
• Lab work, etc. all normal and couldn’t tolerate an MRI
• Patient put on diet of no nicotine, caffeine, salt or loud noise and prednisone treatment

PF-Case

• Patient’s hearing had improved but not back to presumed pre-HL levels
• Right exploratory tympanotomy in the OR showed a pooling of clear fluid in the oval window
• Oval Window fistula repaired

Audio is one month post-op

Vestibulotoxicity/Ototoxicity

• Ototoxicity results from exposure to drugs or chemicals that damage the inner ear or the vestibulocochlear nerve. Damage can be to hearing or balance or both.
• Environmental/Chemical:
  - Aspartate/valine
  - Mercury/lead/tin/manganese
  - Styrene
  - Carbon monoxide
  - Toluene
  - Trichloroethylene
  - Xylene
• Loop Diuretics:
  - Bumetanide (Bumex)
  - Ethacrynic acid (Edecrin)
  - Furosemide (Lasix)
  - Torsemide (Demadex)
• Aminoglycoside Antibiotics:
  - Amikacin
  - Netilmicin
  - Dihydrostreptomycin
  - Ribostamycin
  - Gentamicin
  - Streptomycin
  - Teicoplanin
  - Neomycin
• Aspirin:
  - Chloroquine
  - Quinidine/Quinine
  - Tonic water
• Anti-cancer Drugs:
  - Cisplatin
  - Carboplatin

Ototoxicity-Case

• 3 years, 8 months had headache, vomiting and ataxia, vertigo
• CT found a large posterior fossa mass (ependymoma)
• Received chemotherapy over a 14 month period along with radiation between first and second chemo sessions
• First audio after 4th session, no HA but complained about loud sounds

Audiograms: 2-6 All Post Chemo
Vestibular Migraine

Approximately 40% of migraine patients have some accompanying vestibular syndrome involving disruption in their balance and/or dizziness at one time or another. This may be prior to, during, after, or totally independent of their migraine event. Many of the food and environmental triggers for migraineurs are the same as those for patients with non-migrainous vestibular dysfunction. Hormonal fluctuations, foods, and weather changes (barometric-pressure variations) often exacerbate both conditions.

Mal de Debarquement (MDD)

- MDD is a type of vertigo and imbalance that occurs after getting off of a boat.
- The first reference to the syndrome was made by Darwin, in 1796: “Those, who have been upon the water in a boat or ship so long, that they have acquired the necessary habits of motion upon that unstable element, at their return on land frequently think in their reveries, or between sleeping and waking, that they observe the room, they sit in, or some of its furniture, to liberate like the motion of the vessel. This I have experienced myself, and have been told, that after long voyages, it is some time before these ideas entirely vanish. The same is observable in a less degree after having travelled some days in a stage coach, and particularly when we lie down in bed, and compose ourselves to sleep; in this case it is observable, that the rattling noise of the coach, as well as the undulatory motion, haunts us.”

Superior Semicircular Canal Dehiscence

- Vestibular and auditory symptoms and signs can result from a dehiscence (opening) in the bone overlying the superior semicircular canal of the inner ear. Patients with SSCD can experience: vertigo and oscillopsia (the apparent motion of objects that are known to be stationary) evoked by loud noises and/or by maneuvers that change middle-ear or intracranial pressure (such as coughing, sneezing, or straining).
- Auditory manifestations of the syndrome include autophony (increased resonance of one’s own voice), hypersensitivity to bone-conducted sounds, and an apparent conductive hearing loss revealed on audiometry.

SSCD-Case

- Because patient was complaining of dizziness, determination to repair the dehiscence was made.
- Post-op audio reflects improved LF hearing and a slight HF HL.

SSCD-Examples
Vestibular Schwannoma

Vestibular schwannoma is a benign (nonmalignant), usually slow-growing tumor that develops from the balance and hearing nerves supplying the inner ear. As the acoustic neuroma grows, it compresses the hearing and balance nerves, usually causing unilateral hearing loss, tinnitus, and dizziness or loss of balance. As it grows, it can also interfere with the facial (trigeminal) nerve, causing facial numbness.

Aging of the Vestibular System

Aging of the vestibular nerve endings begins at about age 55, with blood flow to the inner ear also decreasing. This type of slow loss of vestibular function may be first noticed as difficulty walking or standing, especially in the dark while on soft or uneven surfaces (such as thick carpet or a forest path).

Metabolic/Hormonal/Vascular Disorders

Metabolic, hormonal and vascular disorders are considered to cause progressive sensorineural hearing loss (PSNHL) and can cause vertigo as well. The diseases most commonly associated with PSNHL are diabetes mellitus, congenital and acquired hypothyroidism, chronic renal failure, and chronic labyrinthine ischemia.

Traumatic Brain Injury

The bruising from the brain moving in the skull can affect/cause injury to:
- The pinna
- The tympanic membrane (rupture)
- The ossicular chain creating hearing loss
- The vestibular system or cerebellum which affects balance
- The frontal/pre-frontal cortex which effects attention and listening
- The parietal lobe effecting spatial processing
- The occipital lobe which affects visual processing.

TBI-Case

Hit by baseball bat-depressed basilar skull fracture
- Post-Concussion syndrome
- Profound SN HL
- Tinnitus
- Vertigo
- Vision Loss
- PTSD
TBI—What to Do?

Tried:
• HA
• FM
• Auditory Training

<table>
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<th>Question</th>
<th>Pre-Training</th>
<th>Post-Training</th>
<th>3 months Later</th>
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<tr>
<td>1-1 Conversation in Quiet</td>
<td>40%</td>
<td>80%</td>
<td>100%</td>
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<tr>
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<td>40%</td>
<td>60%</td>
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<tr>
<td>Conversation by someone I know well</td>
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<td>70%</td>
<td>90%</td>
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Labyrinthitis/Meningitis

Neuritis/Labyrinthitis
Labyrinthitis is usually caused by a virus or bacteria. Having a cold or flu can trigger the condition. Less often, an ear infection may lead to labyrinthitis. Other causes include allergies or certain drugs that are bad for the inner ear.

Meningitis
Meningitis is a disease caused by the inflammation of the protective membranes covering the brain and spinal cord known as the meninges. The inflammation is usually caused by an infection (bacterial OR viral) of the fluid surrounding the brain and spinal cord.

Stroke

Ischemic strokes are caused by blockage of blood vessels. Hemorrhagic strokes are caused by leakage of blood within the brain. These blocks are commonly caused by too high blood pressure.

Questions

Enter your question in the Question Box on your webinar dashboard.

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