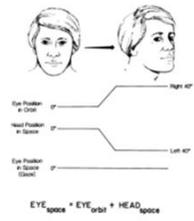


Otologic Dizziness (Dizziness from Ear)

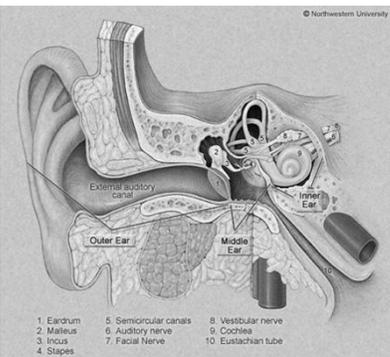
Timothy C. Hain, MD
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Vestibular Reflexes

- VOR: Vestibulo-ocular reflex
- VSR: Vestibulospinal reflex



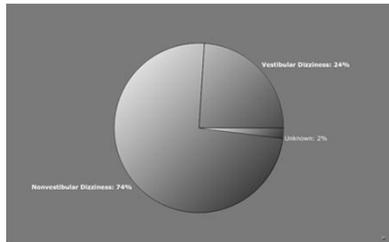

Ear Structures



1. Eardrum
2. Malleus
3. Incus
4. Stapes
5. Semicircular canals
6. Auditory nerve
7. Facial Nerve
8. Vestibular nerve
9. Cochlea
10. Eustachian tube

Epidemiology of Dizziness

Otologic is about 1/4

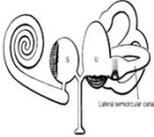


29.5% lifetime prevalence of dizziness or vertigo
7% lifetime prevalence of vestibular vertigo, 1-year prevalence is 5.2%

Neuhauser et al, Neurology 65:898-904 2005

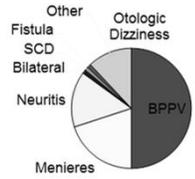
The ear is an inertial navigation device

- Semicircular Canals are rate sensors.
- Otoliths (utricle and saccule) are linear accelerometers
- Bilateral symmetry means redundant design.




Otologic (Ear) Dizziness

- BPPV (benign paroxysmal positional vertigo) -- about 50% of otologic, 20% all
- Meniere's disease -- about 20%
- Vestibular neuritis and related conditions (15%)
- Bilateral vestibular loss (about 1%)
- SCD and Fistula (rare but worth knowing)



Positional Vertigo
The most common syndrome

■ **Benign Paroxysmal Positional Vertigo (BPPV) -- bed spins**

- Orthostatic hypotension (dizzy upright)
- Central positional nystagmus (dizzy everywhere)
- Low CSF pressure syndrome (dizzy upright)

Benign Paroxysmal Positional Vertigo (BPPV)

- 20% of all vertigo, 2% prevalence/year
- Brief and strong
- Provoked by change of head position
- Definitively diagnosed by Hallpike test

Neuhauser, H. K. (2007). "Epidemiology of vertigo." *Current opinion in neurology* 20(1): 40-46.

Benign Paroxysmal Positional Vertigo (BPPV)

61 Y/O man slipped on wet floor.
LOC for 20 minutes.
In ER, unable to sit up because of dizziness
Hallpike Maneuver: Positive

BPPV Mechanism: Utricular debris migrates to posterior canal

Positional Vertigo
Dix-Hallpike Maneuver

BPPV treatment

- Medication (e.g. antivert) – minor benefit
 - May avoid vomiting by pretreating
- Excellent response to PT
- Surgery – canal plugging if rehab fails (need more rehab after plug). Rarely done.

Unilateral Vestibular

- Vestibular Neuritis/Labyrinthitis (common)
- Meniere's disease (unusual, 1/2000 prevalence)
- Acoustic Neuroma (rare)
- Vestibular paroxysmia (not sure how common)

Vestibular Spontaneous Nystagmus recorded on ENG (Electronystagmography)

Vestibular Neuritis: Case

56 y/o woman began to become dizzy after lunch. Dizziness increased over hours, and consisted of a spinning "merri-go-round" sensation, combined with unsteadiness.

Vomiting ensued 2 hours later, and she was brought by family members to the ER.

HIT test should be positive

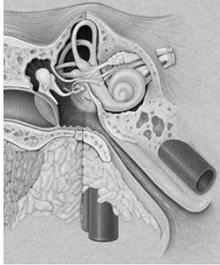
Vestibular Spontaneous Nystagmus seen with video Frenzel Goggles

Aside : how to examine for SN

- Frenzel Goggles (best)
- Ophthalmoscope (good –but backwards)
- Gaze-evoked nystagmus (use Alexander's law)
- Sheet of white paper (Ganzfeld – German for complete field)

Vestibular Neuritis -- rx

- Disturbance of unknown cause (Viral ? Vascular) involving vestibular nerve or ganglion
- Off work -- usually 2 weeks.
- Symptomatic Rx (meclizine, phenergan, benzodiazepine)
- Rehab if still symptomatic after 2 months.
- These patients can still get BPPV!



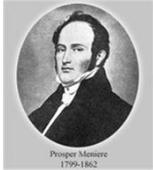
Meniere's disease – symptoms

- Progressive hearing loss -- usually go deaf
- Episodic vertigo – out of commission for several days
- Ataxia – gradually increases over years
- Visual sensitivity →



Meniere's Disease

- Prosper Meniere
 - Fluctuating hearing
 - Episodic Vertigo
 - Fluctuating (roaring) Tinnitus
 - Aural Fullness
- About 1/2000 people in population
- Chronic condition – lasts lifetime



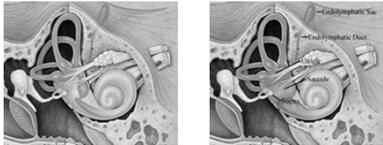
Visual Sensitivity is common

- Sensory integration disorder – upweight vision, downweight everything else
- Grocery store, Omnimax, Target, etc
- Typical of disorders with intermittent vestibular problems



Etiology of Meniere's (Dogma)

- Dilation and episodic rupture of inner ear membranes (Endolymphatic Hydrops)
- As endolymph volume and pressure increases, the utricular/saccular and Reissner's membranes rupture, releasing potassium-rich endolymph into the perilymph causing cochlear/vestibular paralysis



Otolithic Crises of Tumarkin

- Drop attacks
- Go from upright to on floor in fraction of second
- No LOC
- Very dangerous
- Destructive treatment is best



Treatments of Menieres

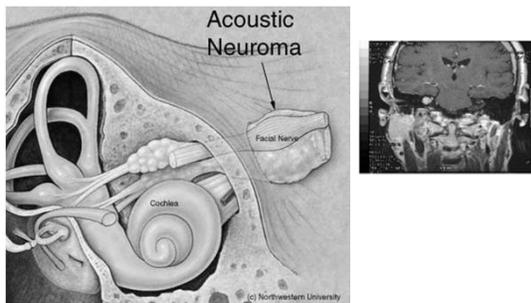
- Medical management
 - Low sodium, betahistine
- Bad rehab candidate while fluctuating
- Surgery
 - Low dose gentamicin treatment works 85%
 - High dose gentamicin treatment (overkill)
- Rehab useful post destructive treatment

Hain TC, Ostrowski T. Unsteady Influence. Menieres disease. Advances for directors in rehabilitation October 2007, 51-51

Treatment of Acoustic Neuroma

- Watchful waiting (about 25%)
- Operative removal (about 50%) – losing ground
- Gamma Knife (about 25%) – gaining ground because effective and noninvasive
- Good rehab candidate after surgery or gamma knife.

Acoustic Neuroma

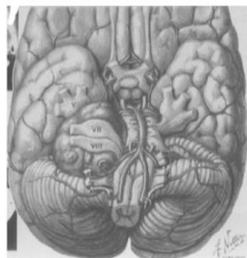


Vestibular Paroxysmia (VP, AKA microvascular compression)

- Irritation of vestibular nerve
- Quick spins, tilts, dips
- Motion sensitivity
- May follow 8th nerve surgery, Gamma knife treatment, acoustic neuroma

Acoustic Neuroma

- Rare cause of unilateral vestibular loss
- Generally also deaf on one side
- Slowly progressive – little or no vertigo



Clinical Diagnosis of VP

- Quick spins
- May have nystagmus on hyperventilation
- Response to anticonvulsant
- No rehab potential



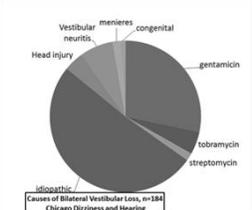
Bilateral Vestibular Loss

A stewardess developed a toe-nail infection. She underwent course of gentamicin and vancomycin. 12 days after starting therapy she developed imbalance. 21 days after starting, she was “staggering like a drunk person”. Meclizine was prescribed. Gentamicin was stopped on day 29. One year later, the patient had persistent imbalance, visual symptoms, and had not returned to work. Hearing is normal. She unsuccessfully sued her doctor for malpractice.

Bilateral Vestibular Loss

Causes:

- Ototoxicity !
- Bilateral forms of unilateral disorders (e.g. bilateral vestib neuritis)
- Congenital (e.g. Mondini malformation)
- idiopathic



Hain TC, Cherchi M, Yacovino DA. Bilateral Vestibular Loss. In Seminars in Neurology (ed File). 2013.

SYMPTOMS OF BILATERAL VESTIBULAR LOSS

- OSCILLOPSIA




DIAGNOSIS IS EASY

- History of recent IV antibiotic medication
- Eyes closed tandem Romberg is positive
- Dynamic illegible ‘E’ test (DIE) failed

--->

SYMPTOMS OF BILATERAL VESTIBULAR LOSS

- ATAXIA



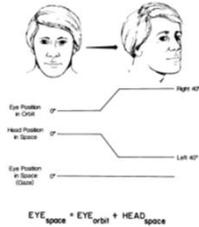

Dynamic Illegible ‘E’ test (DIE test)

- Distance vision with head still
- Distance vision with head moving
- Normal: 0-2 lines change.
- Abnormal: 4-7 lines change



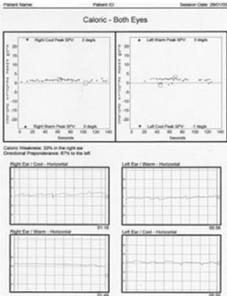
Rapid Dolls failed

- VOR: Vestibulo-ocular reflex

DIAGNOSIS Continued

- ENG shows little or no response



LABORATORY DIAGNOSIS

Everything should be “dead”

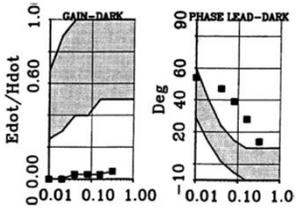
- ENG
- Rotatory chair
- VEMP (may remain in bilateral v. neuritis)

Treatment Bilateral

- No medical management (other than avoiding more damage)
- Outstanding rehab candidate
- Be prepared for a deposition

DIAGNOSIS Continued

- Rotatory chair confirms diagnosis but requires cooperation

Perilymph Fistula and SCD (superior canal dehiscence)

Fluctuating conditions
No rehab until after surgery



- Superior Canal Dehiscence

Case: WS

Retired plastic surgeon, with impaired hearing related to war injuries, found that when he went to church, when organ was playing, certain notes made him stagger. His otolaryngologist noted that during audiometry (with hearing aid in), certain tones reliably induced dizziness and a mixed vertical/torsional nystagmus. This "Tullio's phenomenon" could be easily reproduced experimentally. MRI scan was normal.

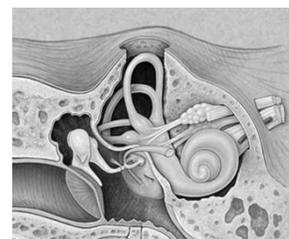


Tullio in SCD

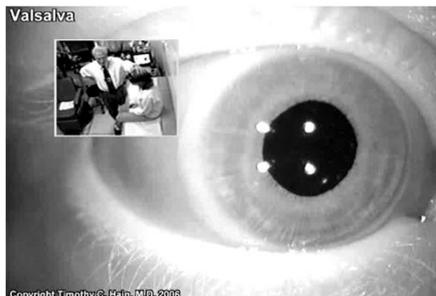


Superior Canal Dehiscence

- Etiology:
 - Congenital bone defect (2% ?)
 - Trauma may exacerbate
- Treatment:
 - Do nothing
 - Surgical
 - » Plug
 - » Resurface



Valsalva in SCD



Diagnosis of SCD

- History of sound and pressure sensitivity
- Valsalva test is easiest bedside test
- Temporal bone CT scan (0.6 mm, axial reformatted into oblique planes)
- VEMP: Vestibular evoked myogenic potentials (screen with amplitude, then do threshold)

Case: KF

- After SCUBA diving, a young woman developed vertigo, aural fullness and tinnitus for 1 year.
- Symptoms were worsened by tragal pressure and straining. Surgery was performed.



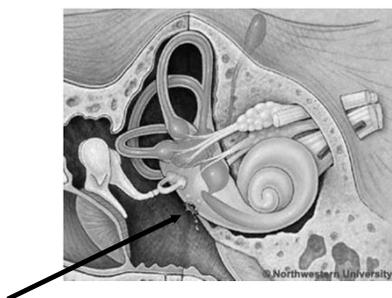
More details

Hain, T.C. Approach to the patient with Dizziness and Vertigo. Practical Neurology (Ed. Biller), Lippincott-Raven

More movies

www.dizziness-and-hearing.com

A large round window fistula was found and symptoms completely resolved after a second surgery.



Formulating your impression

- Otologic (30-50%) – BPPV, Menieres, VN.
- CNS (5-30%) – CVA, Migraine
- Medical (5%-30%) Orthostatic, drug
- Psychiatric (15-50%)
- Undiagnosed (15%)

