Evaluation and Treatment of Vertigo Patients

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Balance is Bigger Than any one Person

Otoneurology

- PMD
- Physical Therapy
- Otolaryngology
- Radiology
- Audiology
- Cardiology
- Neurosurgery

Team Effort

Clinical Presentation

The patient history is very important in evaluating the patient's complaints of disequilibrium.

Duration of Symptoms

- Seconds to minutes
- Hours
- Chronic
- And finally, is it positional related?

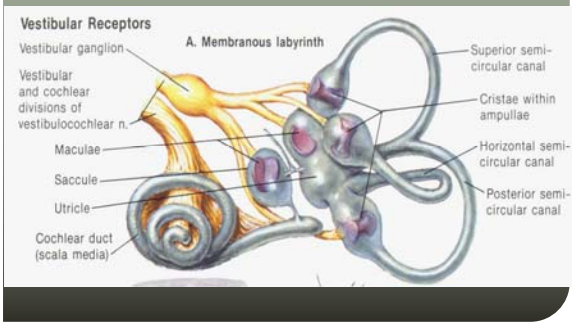
Symptoms Lasting Seconds to Minutes

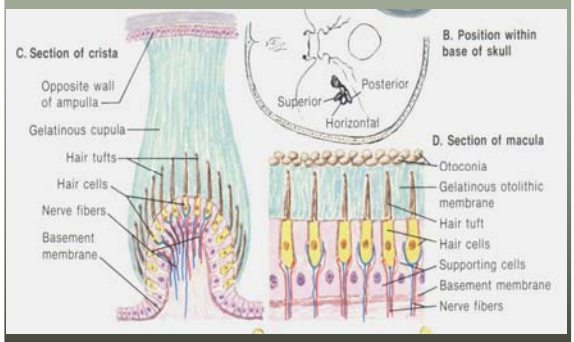
- Benign Paroxysmal Positional Vertigo (BPPV)
- Cardiac arrhythmia
- Orthostasis
- Vestibular migraine (VM)

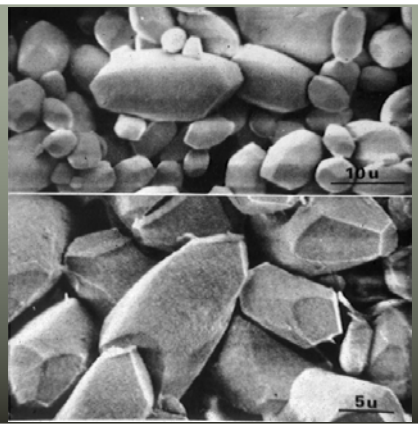
Benign Paroxysmal Positional Vertigo (BPPV)

- Approximately 20% of all dizziness is caused by canalithiasis. 50% of all dizziness in the elderly is due to BPPV.
- In our Otoneurology practice approximately 45% of our patients are diagnosed with canalithiasis
- Symptoms include frank vertigo, lightheadedness, imbalance, disequilibrium, nausea, and vomiting.
- The patient typically complains of paroxysmal episodes of vertigo that occur with changes in head position with respect to gravity. The episodes of vertigo last for seconds to minutes and improve/resolve with keeping head still in a neutral position.
- Common exacerbating head movements include lying supine and moving in a yaw-like fashion to the right or left, pitching head up (as in reaching for something on the top shelf) or down (picking something up off the ground or looking under the kitchen sink).

Benign Paroxysmal Positional Vertigo (BPPV)







Etiology of Canalithiasis

- Idiopathic
- Viral
- Post-traumatic
- Meniere's disease
- Vestibular migraine
- Post-surgical
- Vertebrobasilar insufficiency
- Acoustic neuroma

Diagnosis of BPPV Dix-Hallpike Maneuver

Diagnosis of BPPV Supine positional testing

Right Posterior Canalithiasis

Treatment Options Include

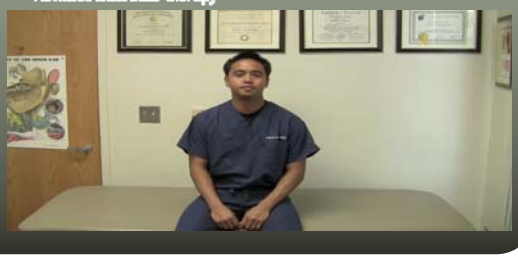
- Table canalith repositioning maneuvers (Epley Maneuver)
- Epley Omniax Chair
- Experimental canalith repositioning maneuver chairs
- Home Treatment Maneuvers:
  - Brandt-Daroff Maneuver
  - Semont Maneuver

Epley Maneuver for Left Posterior Canalithiasis

Epley Omniax Chair Treatment for Right Posterior Canalithiasis

Brandt-Daroff Maneuver

- Pause for 30 seconds at each position
- Perform 10 3-5x per day x 2 week
- Vibration skull base therapy

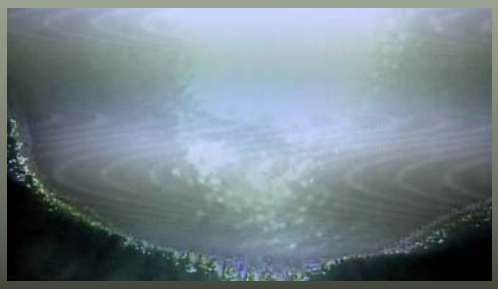


Semont Maneuver

- Also known as the Liberatory Maneuver.
- Pause for 30 seconds at each position
- Perform 10 3-5x per day x 2 weeks

Lateral Canalithiasis
Bilateral ageotropic nystagmus

Lateral Canalithiasis
Bilateral geotropic nystagmus



Treatment for Lateral Canalithiasis in Epley Omniax Chair

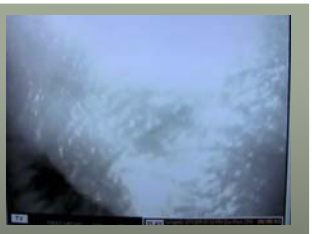
Anterior Canalithiasis

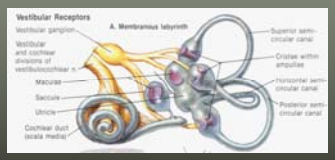
- Rare
- Identification can be difficult.
- Treatment involves forward 360 degree maneuvers with head vectored to the right for treatment of a left anterior canalithiasis and head vectored to the left for the a right anterior canalithiasis.
- Treatment for a left anterior canalithiasis is shown on the next slide.

Treatment for Left Anterior Canalithiasis

Crus Block

- Complication of BPPV treatment.
- Immediate treatment with barrel rolls towards the opposite side of treated canal.





Instructions for Patients Post-BPPV Treatment

- Sleep with head center and elevated at least 30 degrees for 7-10 days.
- Minimize high gain head accelerations and keep head above the level of the heart.
- Avoid kitchen sink maneuver.
- There are studies that have shown that these postural restrictions are unnecessary as they do not have significant effect on the final outcomes of BPPV treatment.

Cardiac Arrhythmia

"I was minding my own business."

- Symptoms of lightheadedness, "wooziness," or dizziness without any clear exacerbating factors.
- May be associated with presyncope, syncope, shortness of breath or palpitations.
- Referral for cardiac workup to include carotid US, echocardiogram, and 21 day event monitor.

Orthostasis

- The patient complains of lightheadedness, dizziness, or disequilibrium when standing from a seated or supine position.
- Symptoms better with sitting or standing still with support.
- Positive tilt test on exam.
- Referral for cardiac consult and tilt table study.
- Iatrogenic etiologies?

Symptoms Lasting Hours

- Meniere's disease
- Vestibular migraine

Paroxysmal complaints, not a chronic baseline disequilibrium.

Meniere's Disease

- Classical Meniere's disease:
  - Unilateral aural fullness, tinnitus, low-frequency hearing fluctuation typically preceding vertigo.
  - Vertigo can last for 2-4 hours.
  - The symptoms of aural fullness and tinnitus tend to abate with dissipating vertigo. However, the patient's hearing loss may not recover until a week following the attack.
  - "The patient typically recovers to feeling 100% in between episodes."

Etiology of Meniere's Disease

There are many theories.

Excessive endolymph production or decreased endolymph absorption.

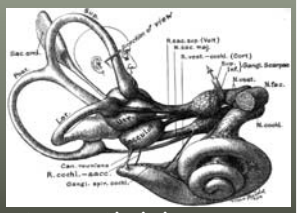
Salt/ionic homeostasis

Autoimmune disorders

Genetic predisposition

Allergies/Migraine

Viral infection/Inner ear traumatic injury

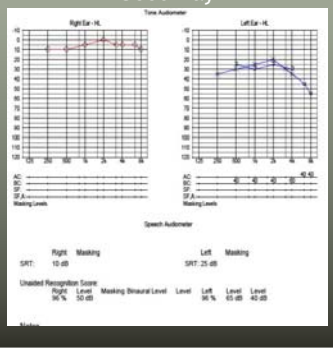


Diagnosing Meniere's Disease

- Clinical diagnosis.
- The key diagnostic feature is fluctuating unilateral low-frequency sensorineural hearing loss.
- It is important to see patients during vertigo attacks in order to obtain oculography and audiometric studies.
- TSH, ANA, RF, RPR, and Lyme Titer
- MRI Brain full with IAC and contrast to evaluate for retrocochlear pathology. CT temporal bone.

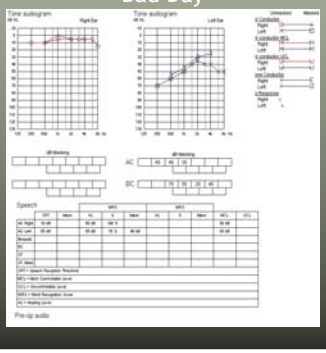
Meniere's patient

Good Day



Meniere's Patient

Bad Day



Diagnosing Meniere's Disease

- Video Nystagmogram (VNG)
- Vestibular Evoked Myogenic Potential (VEMP)
- Serial audiometric exams are very important!!
- Electrocochleography (ECOG)
- Rotatory Chair
- Computerized Dynamic Posturography (CDP)

Meniere's Disease Treatment

- Prevention of further attacks is the goal of treatment.
- Low sodium diet
- Hydrochlorothiazide
- Dyazide (triamterene/HCTZ) and diamox (Potassium-sparing)
- Meniett device
- Betahistine

Meniett Device from Medtronic

Betahistine

- Formerly marketed as Serc, this medication is no longer available in the United States. However, some compound pharmacies can manufacture it.
- Widely used in Europe with some studies showing decreased frequency of vertigo attacks.
- Betahistine is a weak H1 receptor agonist and a more potent H3 receptor antagonist. In peripheral vestibular organs, betahistine reduces the ampullae receptor resting discharge, therefore reducing the firing rate of peripheral ampullar nerves. It also increases vestibular and cochlear blood flow. Centrally, it enhances histamine synthesis and release promoting central vestibular compensation. An added benefit is that is has no sedative effects.
- Recommended dosages vary. Strupp et al reported that the number of Meniere's attacks was significantly lower in a group receiving 48mg PO TID (high-dosage) versus 16 or 24mg TID (low-dosage).
- The median number of attacks at twelve months dropped from 7.6 to 4.4 in the low dosage group and 8.8 to 1.0 in the high dosage group.

Strupp M. et al. Acta Oto-Laryngologica, 2008; 128: 520-524.
Gananca M. et al. *Acta Oto-Laryngologica, 2009; 129: 487-492*

Meniere's Disease Treatment

- Transtympanic Gentamicin injections
- Transtympanic steroid injections
- Endolymphatic shunt surgery
- Labyrinthectomy

Outcomes of Endolymphatic Shunt Surgery for Meniere's Disease: Comparison with Intratympanic Gentamicin on Vertigo Control and Hearing Loss

- M. Jennifer Derebery, Laurel M. Fisher, Karen Berliner, Janice Chung, and Katherine Green. *Otology & Neurotology* 31:649-655. 2010.
- Retrospective study
- The shunt group showed a significantly higher percentage of the best outcome (62%) than the gentamicin group (56%, $p < 0.003$), as well as a higher rate of complete vertigo control (86% versus 71%; $p < 0.001$).

Meniere's Disease Treatment of Acute Attacks

Treat symptomatically

- Valium
- Lorazepam
- Clonazepam
- Meclizine
- Transient increase in HCTZ
- Phenergan
- Oral steroids – Questionable efficacy

Vestibular Migraine (VM)

- 45% of patients with Meniere's disease also have a diagnosis of migraine.
- This is an increasingly common diagnosis.
- This condition is also referred to as migraine associated vertigo, migraine variant, and migrainous vertigo.
- Family history of migraine.
- Vestibular migraine needs to be differentiated from basilar migraine. Vestibular migraine does not fit IHS classification for basilar migraine as isolated vertigo would not meet basilar migraine criteria of having at least two posterior circulation manifestations.

Radtke A. et al. *Neurology 2002;59:1700-1704*

Vestibular Migraine Symptoms

- The duration of vertigo ranges from seconds (about 10%) and minutes (30%) to hours (30%) and several days (30%).[1]
- Headaches are often absent during attacks, however photo/phonophobia, auras, or visual scotomas may be present.
- Standard migraine triggers.
- Several studies have identified fluctuating low-frequency hearing levels in patients with migraine typical of those seen in patients with Meniere's disease.[2]

1. Lempert T. et al. Ann. N.Y. Acad. Sci. 1164: 242-251 (2009).
2. Baloh, Robert W. *Headache* 1997;37:615-621

Vestibular Migraine

- Etiology not completely understood.
  - Spreading cortical depression over posterior insula and temporo-parietal junctions.
  - CGRP, serotonin, norepinephrine, and dopamine modulate the activities of central and peripheral vestibular neurons. Unilateral release could cause a static vestibular imbalance leading to positional vertigo, whereas bilateral release would cause a state of altered vestibular excitability leading to a motion sickness-type of dizziness.

Lempert T. et al. Ann. N.Y. Acad. Sci. 1164: 242-251 (2009).

Diagnostic Criteria

- Episodic disequilibrium of at least moderate severity.
- Current or previous history of migraine according to HIS criteria.
- One of the following migrainous symptoms during ≥ 2 attacks of vertigo: migrainous headache, photophobia, phonophobia, visual or other auras.
- Other causes ruled out by appropriate investigations.

Lempert T. et al. (2009).

Vestibular Migraine Treatment

- Treatment is similar to migraine headache treatment.
- Triptan and hydration therapy at onset of symptoms.
- Acute treatment with dexamethasone taper x 3 days.
- Prophylactic therapy includes Topamax, TCA's, propranolol, acetazolamide.

Chronic Baseline Disequilibrium

- Patient presents with complaints of feeling chronically (months to years):
  - "Dizzy"
  - "Off"
  - "Cloudy"
  - "Hazy"
  - Walking like they are drunk
  - Walking on a boat or uneven surface
  - Pushed off to one side
  - Difficulty concentrating and focusing eyes

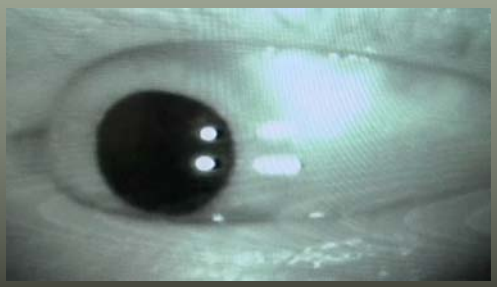
Symptoms

- The patient's symptoms wax and wane throughout the day and are made worse with:
  - High gain head accelerations in non-specific directions
  - Multiple visual stimuli (Costco syndrome). Optokinetic hypersensitivity
  - Stress and fatigue/concentration difficulties
  - Standing and Walking
- Symptoms made better with:
  - Lying supine and holding head still

Signs

- Physical exam is generally benign with exception of:
  - Swaying or positive Romberg test
  - Impaired tandem gait
  - Possible unilateral hearing loss
  - Positive head thrust test
  - Difficulty with smooth pursuit and saccades
  - Infrared video oculography remarkable for sustained left beat or right beat nystagmus

Sustained Left-Beating Nystagmus



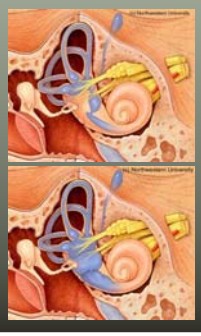
Etiologies

- Vestibular neuronitis (Viral)
- Labyrinthitis (Viral)
- Chronic Meniere's disease
- Acoustic neuroma
- Brainstem stroke
- Cerebellar stroke
- Hemorrhagic arteriovenous malformation (AVM) in the cerebellum
- Iatrogenic etiologies

Vestibular Neuronitis

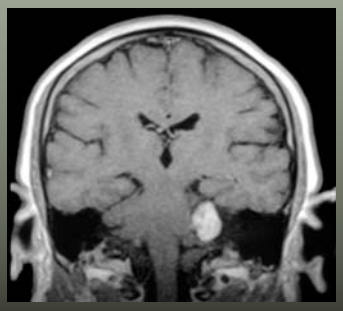
- Typically caused by a viral insult to vestibular nerve.
- Acute onset vertigo that can last 2-4 days.
- Patient is left with residual disequilibrium and complains of "not feeling right."
- Typically symptoms gradually improve and resolve in 3-4 weeks. However, the patient may be left with a chronic baseline disequilibrium.

Chronic Meneire's Disease



- Secondary to chronic compression of the hair cells in the vestibular system, the patient develops a unilateral chronic vestibulopathy.

Acoustic Neuroma



Cerebellar Stroke

Chiari Malformation

Iatrogenic Etiologies

Almost all medications have "dizziness" as an adverse affect.

Diagnostic Studies

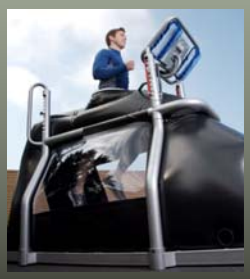
- Audiometric testing
- Infrared video occulography
- Imaging studies
- Metabolic Workup
- Video Nystagmography (VNG) or Electronystagmography (ENG)
- Vestibular evoked myogenic potentials (VEMP)
- Rotatory Chair/VAT studies

Treatment for Chronic Vestibulopathy

- Mainstay is aggressive vestibular therapy with a focus on visual-vestibular stabilization protocols.
- In rare cases we utilize:
  - Clonazepam, low-dose
  - SSRI's
  - Betahistine

Treatment of Chronic Vestibulopathies Force Dynamics 301

Alter-G Treadmill



Spineforce

Case Study

- 31 year-old. Acute onset vertigo with continued chronic baseline disequilibrium 2 months prior to consult.
- Physical exam unremarkable with exception of infrared video oculography that was consistent with a right lateral canalithiasis.
- MRI brain IAC protocol remarkable for a hemorrhagic mass in the right cerebellar hemisphere.

Right Cerebellar Hemangioma