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Debunking Vestibular Migraine

Kaitlin Ryan, Au.D., CCC-A



Kaitlin Ryan, AuD, CCC-A

Kaitlin Ryan graduated with her Doctorate of Audiology from Northeastern University in 2019 and had a quick launch into vestibular audiology through the Department of Veterans Affairs in Palo Alto, CA serving veterans across hundreds of miles. This developed into sitting on fall prevention committees, working as an Audiology liaison for a geriatric interdisciplinary clinic and on teams of providers working to rehabilitate active-duty special forces service people after they sustained brain trauma. Currently, Kaitlin is working in a large hospital on a team of 4 vestibular audiologists in conjunction with ENT physicians to serve a significant portion of Massachusetts, helping to better characterize and understand their dizziness. Prior to this, she had the opportunity to study how hearing and balance changes during spaceflight as an intern at NASA, solidifying her passion for bettering the lives of others through audiology.

Disclosures

- **Presenter Disclosure:** Financial: Kaitlin Ryan received an honorarium for this course. Non-financial: Kaitlin Ryan has no relevant non-financial relationships to disclose.
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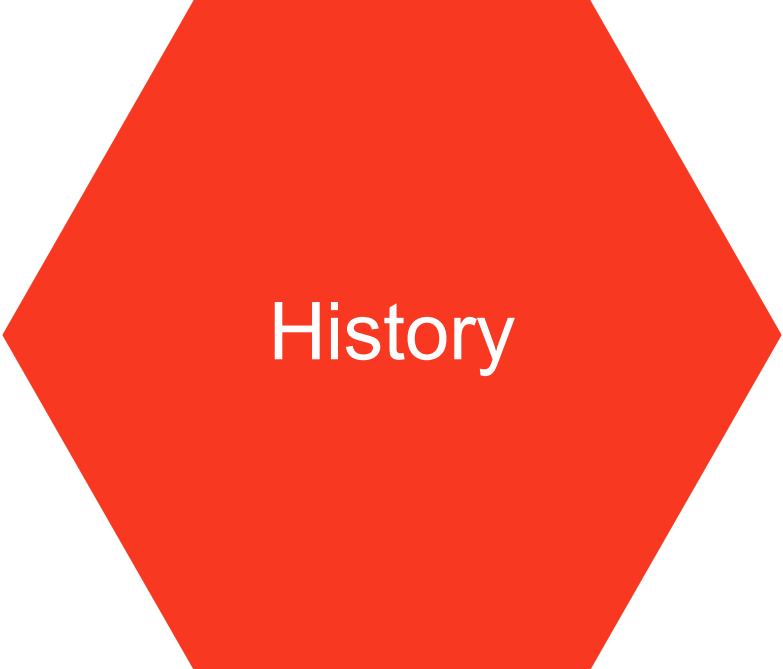
Learning Outcomes

After this course, participants will be able to:

1. Identify key aspects of the diagnostic criteria and clinical features for vestibular migraine.
2. Identify aspects of case history that separate vestibular migraine from other vestibular disorders.
3. Discuss how to recommend tests/treatment options better tailored to vestibular migraineurs per evidence based research.

Agenda





History

History

- Relationship of dizziness and migraine dates to the 19th century
- Electrical origins also appeared as early as 19th century
 - Described analogously to Epilepsy
- Vascular origins of migraines as early as the 17th century
- 1984 landmark study defining vestibular migraine as its own entity.
- First consensus diagnostic criteria published in **2012**



Epidemiology

Epidemiology

Baloh, 2020 (1)	Lempert and von Brevern, 2019 (8)	Li et al, 2021 (9)	Consensus Document, 2012 (7)	Jacobson et al, 2016 (6)
• 1-3% of the general population • 10-30% of individuals seeking treatment for dizziness • 1/3 of migraine patients experience vertiginous variant in their lifetime • Female to male ratio: 4:1 • Migraines without vertigo 2:1 • Mean age of onset: 14y • Visual aura as early as 8y	• Lifetime prevalence 1% • 1 year prevalence 2.7% • Recurrent vertigo of unknown origin, prevalence of migraine 60-80% • Vestibular migraine in 10-20% headache clinics	• Annual/lifetime prevalence of .89-.98% • ENT clinic: 4.2-29.3% • Headache clinic: 9-11/9% • Dizziness clinic: 6-25.1% • Female to male ratio 1.5-1	• 1% prevalence in general population • 11% of patients reporting to dizzy clinics • Autosomal dominant inheritance has been studied in several families	• 1% prevalence in general population • 5:1 female to male ratio • Mean age of onset: 38 females, 42 males • Migraine predates vertigo by average of 8y • Study of 724 children: • 27.8% diagnosis of VM, BPV-C 15.68%

Pathophysiology

Electrical/ Neurologic

- “nerve storm” analogous to Epilepsy
- Intense excitation across the visual cortex
- Closely related to the dilation and constriction of blood flow/ electrical activity

Vascular

- Study of intra and extracranial blood flow led to the trial of vasodilators
- Restricted blood flow to visual cortex
- Migraines caused by vasodilation of extracranial flow and constriction of intracranial flow
- Comorbidity of vascular events more likely in migraine with aura

Genetic component

- Migraines are considered a genetic disease
- 40-90% patients have (+) family history
- Compared to Epilepsy again
- Heritability of migraine with aura higher than without

Diagnostic Criteria/
Clinical Features

Diagnostic Criteria for Vestibular Migraine

A) At least 5 episodes with vestibular symptoms of moderate/severe intensity, lasting 5min-72hrs

AND

B) Current or previous history of migraine with or without aura per ICHD-3

AND

C) 1+ migraine features with at least 50% of vertiginous episodes

AND

D) Not better accounted for by another vestibular or ICHD diagnosis

Diagnostic Criteria for Vestibular Migraine

Qualifying vestibular symptoms:

- 1) Spontaneous vertigo- false sense of motion of visual spinning/flowing
- 2) Positional vertigo (following change in head position)
- 3) Visually induced vertigo
- 4) Head-motion induced vertigo (during)
- 5) Head-motion induced dizziness with nausea- disturbed spatial orientation

Qualifying Migraine features:

- 1) Headache with at least two of the following characteristics:
 - 1) 1-sided location
 - 2) Pulsating quality
 - 3) Moderate or severe pain intensity,
 - 4) Aggravation by routine physical activity
- 2) Photophobia and phonophobia
- 3) Visual aura

Diagnostic Criteria for Probable Vestibular Migraine (not in the ICHD-3)

A) At least 5 episodes with vestibular symptoms of moderate/severe intensity, lasting 5min-72hrs

AND

B) Only 1 of criteria B or C fulfilled from vestibular migraine category

Current or previous history of
migraine w/ or w/o aura per ICHD-3

OR

1+ migraine features with at least
50% of vertiginous episodes

AND

D) Not better accounted for by another vestibular or ICHD diagnosis

Case 1 “Fallon”

- 15y/o female, referred by neurology
- Successive concussions started symptoms
- Vestibular Symptoms:
 - Monthly to weekly basis, lasting hours
 - Spinning, changes in depth perception, nausea, blurred vision, oscillopsia, motion sickness, positional changes are trigger
- Migraine symptoms:
 - Headaches worsen symptoms but are not always present
 - Light and sound sensitivity
 - Brain fog
- Otologic symptoms:
 - Bilateral aural fullness and tinnitus
 - Alternates ears, is not constant
- Diagnostic criteria met?

Case 2 “Linda”

- 30y/o female, referred by ENT, following by neurology
- MVA in 2016 causing onset of right temporal headaches, vestibular symptoms onset in 2021
- Vestibular symptoms:
 - Seconds to minutes long episodes, occurring several times per week
 - Illusion of movement/ distorted vision when in motion
 - Supermarket syndrome
- Migraine symptoms:
 - 2-3 per week, lasting hours
 - 7/10 intensity, light and sound sensitivity
 - No aura specifically, sees halos at all times
 - Not often with dizziness, if headache present, does not affect dizziness
- Otologic symptoms
 - Bilateral tinnitus that fluctuates with dizziness
- Diagnostic criteria met?

Case 3 “Valerie”

- 62 y/o female, referred by PCP
- Two types of vestibular symptoms, onset of 1 and 6y ago.
- Vestibular symptoms:
 - “Dizziness”: constant feeling of being in motion when not-increases in seconds long bursts
 - “vertigo”: spinning with nausea and vomiting. Occurs 1-2x per month lasting days.
- Migraine symptoms:
 - With “vertigo” only- visual aura (spots), light and sound sensitivity, head pain, disorientation
- Otologic symptoms:
 - None

Case 4 “Hannah”

- 39y/o female, referred by neurology
- Suspicion of vestibular migraines
- Vestibular symptoms:
 - Monthly episodes, lasting minutes to days
 - Room spinning, visual disorientation, imbalance and nausea.
 - Some association with menstrual cycle for larger episodes, milder are random
- Migraines symptoms:
 - Not exclusive to dizziness
 - Head pain, reduced depth perception, light sensitivity, aura
- Otologic symptoms:
 - Bilateral tinnitus, aural fullness, muffled hearing with dizziness and migraines
- Diagnostic criteria met?

Case 5 “Lauren”

- 25 y/o female, referred by the emergency department
- At the time of referral: bilateral ear infections, vertigo, headache and otalgia were the taglines
- Vestibular symptoms:
 - Occurs most days and is relatively constant- onset 2mo previously
 - Spinning and imbalance, nausea- worse if moving, better if laying
- Migraine symptoms:
 - Diagnosed when vestibular symptoms started
 - Headache, light and sound sensitivity
 - Vestibular symptoms significantly worsened by migraine
- Otologic symptoms:
 - Otolgia. Normal audiometric exam
- Diagnostic criteria met?

Case 6 “Stacy”

- 65y/o female, referred by PCP
- Vestibular symptoms:
 - Onset 10y ago- episodes are sporadic and last seconds- no known trigger
 - Lightheadedness, boat rocking, occasional blurred vision, imbalance
- Migraine symptoms:
 - Headache, cranial/cervical pressure most days, **no diagnosis of migraines**
- Otologic symptoms:
 - Bilateral tinnitus, unchanged with symptoms
- Diagnostic criteria met?

Case 8 “Anna”

- 45y/o female, referred by ENT (neuro-otologist)
- Vestibular symptoms:
 - Onset 4y ago
 - Whirling vertigo daily lasting the whole day, imbalance, blurred vision
- Migraine symptoms:
 - Headache (L side, neck), visual aura, light sensitivity, **no diagnosis of migraines per chart review**
- Otologic symptoms:
 - Mild to moderate sensorineural hearing loss bilaterally
- Diagnostic criteria met?

Case 9 “Louis”

- 17 y/o male, referred by ENT
- Suspected diagnosis of “silent migraines”
- As a child, one day per month with intense nausea, vomiting
- Frequently car sick as a child
- Vestibular symptoms:
 - Last 1 week and occur monthly
 - The day before onset, excessive fatigue
 - Spinning, on a boat, nausea-episodes worse during school
- Migraine symptoms:
 - No head pain, no aura, no light or sound sensitivity, sleeps entire episodes
- Otologic symptoms:
 - None
- Diagnostic criteria met?

					1	2	3	4	5	6	7	8	9	10
5+ episodes lasting minutes to hours with vestibular symptoms	Spontaneous vertigo				+	+	+	+	+	+	+	+	+	+
	Positional vertigo													+
	Visually induced vertigo				+	+	+	+	+	+			+	+
	Head motion induced vertigo				+			+	+			+		+
	Head motion induced dizziness/nausea				+			+	+	+	+			+
Current/previous migraine dx					+	+	+	+	+	+			+	
1+ migraine feature with 50% episodes	Headache with 2+ features	Unilateral pain			+		+			+		+		
		Pulsating quality												+
		Moderate to severe pain	+		+	+	+	+	+	+	+			
		Aggravated by daily routine	+		+	+	+	+	+	+	+			+
	Light and sound sensitivity		+		+				+	+				+
	Visual aura				+	+	+	+				+		
Not better accounted for by another dx					+	+	+	+		+	+		+	
Criteria met?					VM	VM	VM	VM	VM	VM	PVM	PVM	PVM	VM
Another dx criteria met?					+				+			+		+

Clinical features- Baloh (2020) (1)

- 66%+ report vestibular symptoms compared to 12% control group
- Migraine with aura more likely to have vestibular symptoms
 - May be related to vascular and ischemic changes based on cross sectional study, posing higher comorbidity of vascular disease in patients with migraine with aura
- Only 25% of patient experience headache in vertiginous attack
 - Most often attacks occur during headache-free intervals
- During attack: spontaneous or positional nystagmus
- 208 patients with idiopathic vertigo studied retrospectively:
 - 87% met migraine criteria (180- 112 with aura, 68 without)
 - 70% experienced migrainous symptoms with some or all vestibular attacks
 - Most frequent duration: minutes to hours
 - Mimics a cross-sectional European study of 252 patients

Clinical Features – Lempert and von Brevern (2019) (8)

- Duration of episodes:
 - Seconds: 15%- head motion, visual stimulation
 - Minutes: 30%
 - Hours: 30%
 - Days: 25%
 - Recovery time up to 4 weeks, core attack 3 days
- 20-40% experience hearing loss, tinnitus, aural fullness related to acute attacks

Clinical Features - Li et al (2021) (9)

- Spontaneous rotational vertigo 67%
- Positional rotational vertigo 12%
- Positional non-rotational vertigo 12%
- Vestibular dizziness 9%
- Duration:
 - Longer than 5 min: 18-23%
 - Longer than 1 hour: 21.8-33%
 - Shorter than 1 day: 11.5-21%
 - Longer than 1 day: 8.3-27%
- Variation if frequency

Clinical Features

- symptoms reported across the 3 articles

- Spontaneous vertigo
- Visual vertigo
- Positional vertigo
 - 40-70% experience positional vertigo but may not be with every attack
- Head motion induced dizziness
 - Imbalance, illusionary motion, nausea aggravated with movement
- Persistent susceptibility to motion sickness
- Nausea and imbalance
- Light/sound/ smell sensitivity

Clinical features - Reported triggers

- Alcohol
- Lack of sleep
- Fasting
- Diet
- Stress
- Hormonal changes
- Sensory stimuli
- Weather changes

1970 book *Migraine: Evolution of a Common Disorder* by Oliver Sachs

“...presiding over the entire attack there will be a ‘general feeling of disorder’ which may be experienced in physical or emotional terms, and tax or elude the patient’s power of description”.



How do I navigate all this when asking case history?

- Jacobson et al (2016) (5) offers a Diagnostic Interview for Determination of Vestibular Migraine questionnaire
- Ask questions tailored to the diagnostic criteria
 - Allows those questions to be answered *before* a referral is made
 - Use more “patient friendly” terms
- Try not to get hooked on the patient’s specific symptoms and the micro-experiences
- Look for clues about triggers, anxieties, other experiences with vertigo in the past etc.
 - Fishing for possible co-morbidities
- Validate, validate, validate and prepare a patient for testing outcomes

Testing

Jacobson et al (2016) (6)- central positional nystagmus and migraines

- With and without vertigo
- May be spontaneous and positional- typically all the same direction
- In the absence of all other significant findings- may be seen during acute migraine attack
- 12-28% have central positional nystagmus when asymptomatic

- Hearing loss:
 - Low frequency SNHL 3-12%, bilateral mild SNHL 18%
- Vestibular: Central dysfunction in 50% (Li et al)
 - Spontaneous and/or positional nystagmus: 19-70%
 - Gaze evoked nystagmus: 4-23%
 - Abnormal random saccade testing: 3-70%
- Posturography/ Sensory organization task- more likely to show a visual preference and/or vestibular pattern
- May have directional preponderance on rotational testing
 - 25% patients demonstrate some peripheral asymmetry

Testing continued

- Li et al (9)
 - Peripheral dysfunction noted in 15%
 - vHIT abnormal in 9-11%
 - No remarkable changes in VEMP
- Lempert and von Breven (8)
 - Minor signs of central and peripheral dysfunction are common
 - Calorics:
 - Unilateral caloric weakness: 10-20%, usually mild
 - At least ¼ of these patients showed 50% asymmetry
 - Bilateral caloric weakness: 11%
 - Vestibular migraine patients 4x more likely to become emetic during calorics
 - vHIT- unilateral reduced gain 9-11%
 - cVEMP and oVEMP:
 - Reduced amplitude unilaterally or bilaterally: 66%- more likely to have abnormal oVEMP than cVEMP
 - Oh et al (2015) systematic review suggested reduced amplitude in 68% in 2 studies and absent responses in 44% in another
 - Yao et al (2021) showed statistically significant reduced amplitudes and asymmetry ratio compared to controls (N=211)
 - Makowiec et al (2018) more likely to have abnormal oVEMP (72%) or abnormal cVEMP and oVEMP (22%). (N=212)
 - Salviz et al (2016) Differentiating factor from Meniere's disease may be frequency ratio (1000Hz/ 500Hz)

Case	Summary of results
1	Left caloric asymmetry, absent cVEMP left ear, asymmetric OPK (R), +cervicogenic screen and VOMS
2	Asymmetric cVEMPs (R), reduced smooth pursuit, abnormal accuracy random saccade, +cervicogenic screen
3	Abnormal smooth pursuit, 5deg left beating post head shake nystagmus
4	Vision denied gaze evoked nystagmus (beating in direction of gaze), left beating positional nystagmus (no dizziness)
5	100% caloric weakness (R), abnormal vHIT (R), phase leads on SHA, left beating spontaneous nystagmus, left beating post head shake nystagmus, left beating positional nystagmus (no dizziness)
6	Bilateral caloric weakness, abnormal vHIT all conditions, reduced gain on SHA, significantly asymmetric cVEMP (R),
7	Normal
8	Right caloric asymmetry, vHIT normal gain with saccades (R), high frequency phase leads SHA, velocity step testing reduced R conditions, abnormal random saccade, reduced OPK, down beating nystagmus in all positions
9	High gain SHA, asymmetric cVEMP (R), left beating positional nystagmus (no dizziness)
10	Left caloric weakness, phase leads with borderline reduced gain SHA, cVEMP absent 500Hz L, 750Hz and 1000Hz B/L

	Calorics	vHIT	Sinusoidal Harmonic Acceleration	cVEMP	Oculomotor Studies/ spontaneous	Positional	Other
Case 1	26% L (asym)	Normal	Normal	100% L	28% Asymmetry OPK (L)	Normal	+ cervicogenic
Case 2	6% R	Normal	Normal	53% R, 70% R	Abnormal smooth pursuit, random saccade	Normal	+cervicogenic
Case 3	11% R	Normal	Normal	8% L, 4% R	Abnormal smooth pursuit	Normal	5deg LB post heads shake nystagmus
Case 4	13% R	Normal	Normal	CNT	Gaze R and L vision denied	LB in supine, no dizziness	n/a
Case 5	100% R +DP (weakness)	Normal L, abnormal R conditions	Phase leads, normal gain, right asymmetry	9% R, 20% R	LB spontaneous nystagmus	LB in body left no dizziness	6deg LB post headshake nystagmus
Case 6	10% L, bilateral weakness	Abnormal all conditions	Reduced gain, no phase or symmetry	100% R, 31% R	Normal	Normal	+ vertebral artery screen
Case 7	13% R	Normal	Normal	2% R, 11% L	Normal	Normal	n/a
Case 8	42% R -DP (weakness)	Normal gain, saccades all R conditions	Phase leads 0.16-0.32Hz only	0%; 11% L	Abnormal random saccade, reduced OPK	DB nystagmus all positions, no dizziness	Velocity step testing: gain reduced R conditions, low TC
Case 9	4% R	Normal	High gain	39% R, 57% R	21% asymmetry OPK (L)	LB supine and head turn, no dizziness	n/a
Case 10	74% L +DP (weakness)	Normal, saccades R lateral	Phase leads with borderline reduced gain all	100% R, 73% R	Reduced smooth pursuit LEFT only	Normal	n/a

What's the deal with vestibular testing then?

Per the consensus document...

- Overarchingly in research, there is no diagnostic **test** designed to identify vestibular migraine
- Typically, if vestibular function test is abnormal, it is attributable to another issue rather vestibular migraine
- May see atypical results on testing during or shortly after an attack
- Vestibular migraine is entirely classified on case history and features rather than tests

What's the deal with vestibular testing then?

Some pose it allows to rule out other diagnoses and meet “not better accounted for by another diagnosis” criterion

However....
This starts to get tricky when we look...



Comorbidities

Comorbidities/differential diagnoses

- BPPV
- Transient Ischemic Attack
- Vestibular paroxysmia
- PPPD
- Vestibular neuritis/labyrinthitis
- Meniere's Disease
- Migraines induced by vestibular activation
- Migraine aura
- Basilar type migraine

Differential Diagnosis

TIA/stroke:

Similar Features: positional and spontaneous vertigo, occipital headache, brain fog, speech changes

Differentiating Features: length of time with symptoms, vascular factors, limb weakness.

What can be done: HINTS and skew test

BPPV:

Similar Features: positional vertigo

Differentiating Features: nature of nystagmus, length of episodes

What can be done: Positional assessment, canalith repositioning should help BPPV

PPPD:

Similar Features: supermarket syndrome, imbalance, subjective visual vertigo

Differentiating Features: avoidance behaviors, catastrophic thinking, situational worsening unrelated to visual environment

The catch: highly comorbid

What can be done: trial SSRI medications and psychology referrals

Differential Diagnosis

Vestibular Neuritis/Labyrinthitis:

Similar Features: intense vertigo with imbalance and smaller episodes

Differentiating Features: labyrinthitis- hearing loss, often isolated incident

The catch: can be comorbid

What can be done: VNG testing, understanding of timeline of symptoms

Vestibular Paroxysmia

Similar Features: frequency of symptoms, diagnosis by rule out

Differentiating Features: paroxysmia is a vascular condition, length of episodes, triggers identified, other migraine symptoms

What can be done: imaging, trial medication

Meniere's Disease:

Similar Features: length of attack, severity for some, accompanying tinnitus/aural fullness

Differentiating Features: some studies suggest cVEMP, unilaterality versus bilaterality, **hearing configuration**

The catch: highly comorbid

What can be done: stay tuned

Precursors?

- Baloh (2020) noted that in the ICHD-3 there are 4 episodic syndromes associated with migraine in infancy/childhood.
 - Migraine equivalents
 - Follow up studies in children with these syndromes go on to develop typical migraine later in life
- Benign paroxysmal vertigo of Childhood
- Benign paroxysmal torticollis
- Cyclical vomiting
- Episodic abdominal pain
- Additionally, susceptibility to motion sickness in childhood is also considered a precursor to migraine

How can we work to identify early presentations?

- Question asking is based on observations
 - Cyclical vomiting, complaints of abdominal pain
 - Motion sickness
 - Headache complaints
 - Clumsiness
 - Meeting milestones
 - Family history of migraines
- Ask about child's behaviors, if they avoid or are inexplicably afraid of environments and how they play
- Are there patterns to headache/dizzy complaints?
 - Situational, hormonal, behavioral?

Clinical confusion/comorbidity
really comes into play when we
consider vestibular migraine and
Meniere's Disease

Clinical features

Vestibular Migraine (VM)

- Vestibular symptoms:
 - Lasting seconds to days
 - Spontaneous, positional, visually induced, head motion induced
- Migraine symptoms:
 - With and without aura
 - 30% patient have vertigo with headache
 - Light and sound sensitivity
 - Frequent migraine attacks- most common symptom is headache
- Otologic symptoms:
 - Absence of symptoms generally
 - Anecdotal: more often bilateral or alternating between ears

Meniere's Disease (MD)

- Vestibular symptoms:
 - Attacks typically last hours to days
 - Typically spontaneous vertigo
- Migraine symptoms:
 - 2-80% experience migraines
 - Light and sound sensitivity and visual aura occur less in Meniere's patients
- Otologic symptoms:
 - Fluctuating unilateral hearing loss
 - Most sensitive sign
 - Fluctuating unilateral aural fullness and tinnitus

Comorbidity of MD with VM

- VM occurs more often in population of MD patients than general population
 - 28% of MD patients also have VM
 - 2x higher lifetime prevalence
- 51.5% patient with VM are misdiagnosed with MD
 - Co-morbidity is typically the highest cause of diagnostic uncertainty
- Individuals with both VM and MD...
 - Have more frequent vertiginous episodes
 - Are more likely to have cognitive symptoms like “brain fog”
 - Have a statistically significant higher DHI than MD alone
 - Statistically significant higher anxiety than VM and MD alone



Treatment Options

Treatment/ Management

Pharmaceutical

- Antiemetic/benzodiazepine for acute attacks
- Prophylactic
 - Frequent, severe attacks
 - Marginal benefit with migraine medication
 - Drugs chosen by comorbid conditions and side effects
- If episodes are well controlled for 6mo, medication may be tapered

Non-pharmaceutical

- May be more effective than medication
- Thorough counseling- encourage self management
- Lifestyle modification
- Exercise- efficacy conjectured to be similar to prophylactic medication
- Vestibular rehabilitation
 - Habituation, adaptation and substitution, gait training
 - Psychologic benefits
 - Mixed research on success

Treatment of Comorbidities

- Specifically for MD/VM patients:
 - First and foremost, getting diagnosis correct is imperative
 - Often, treatment of predominant symptoms occurs first
 - Migraine treatment is less intrusive than treatments for MD
- Other comorbidities
 - Decompensation- order of onset matters
 - Working to manage predominant symptoms first (headache versus vertigo) before adding

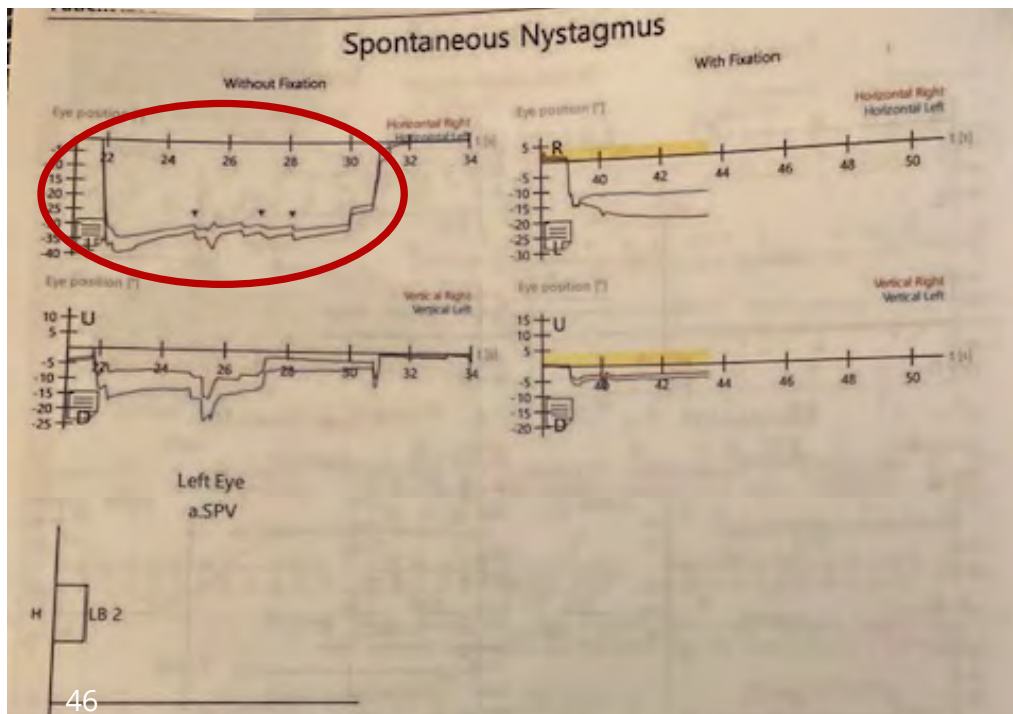
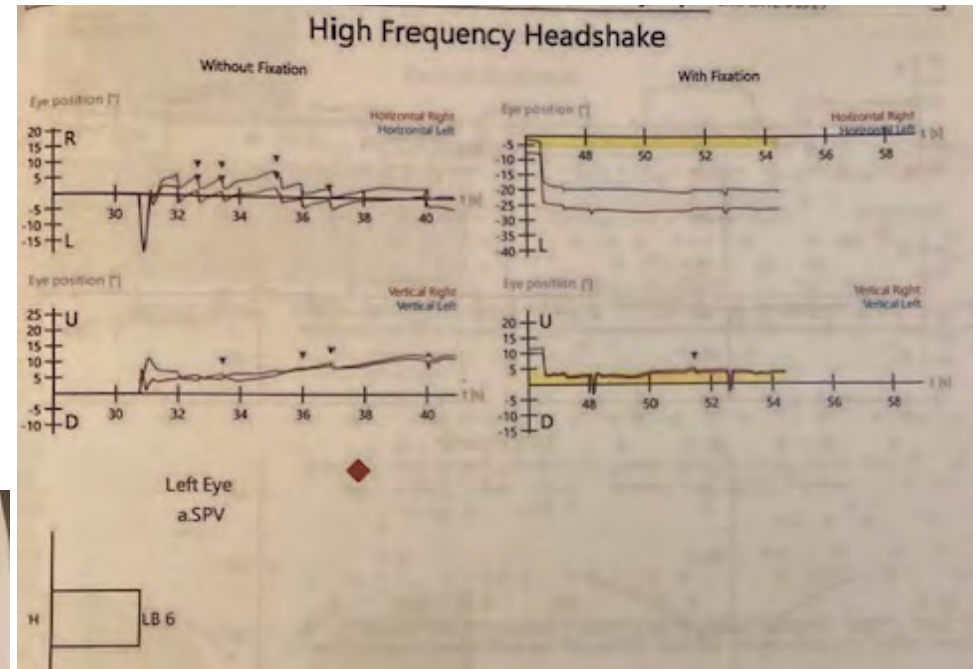
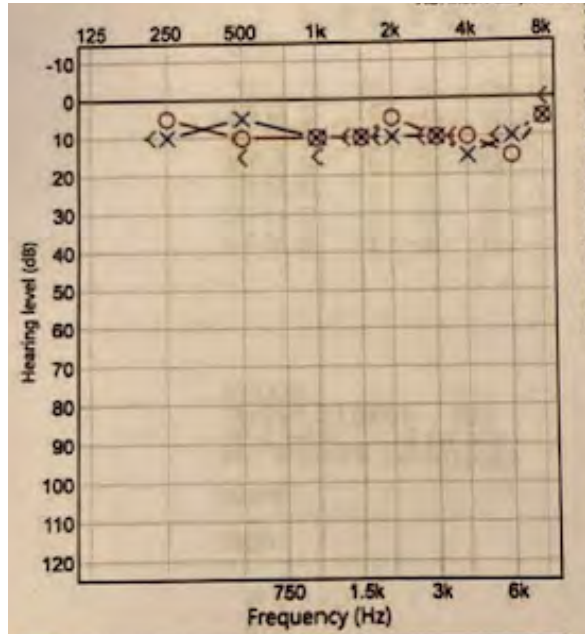


Case Studies

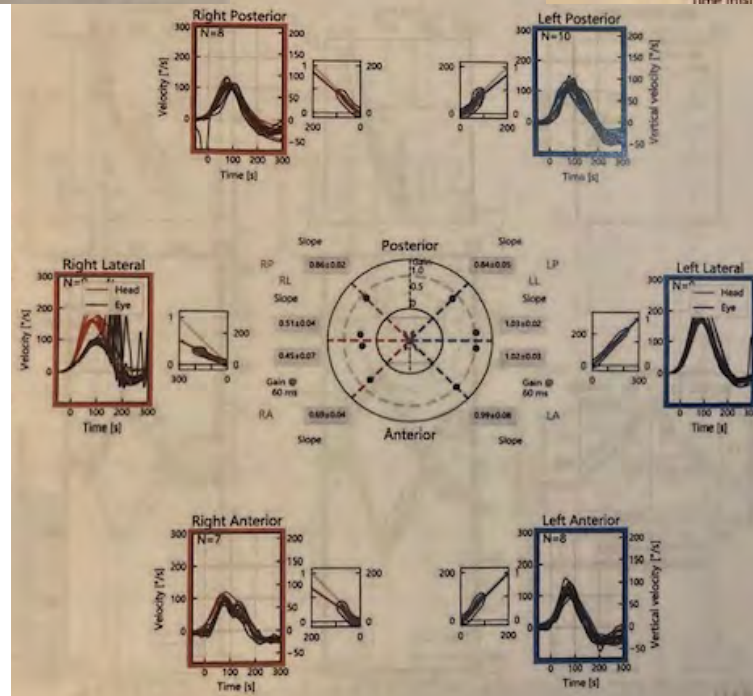
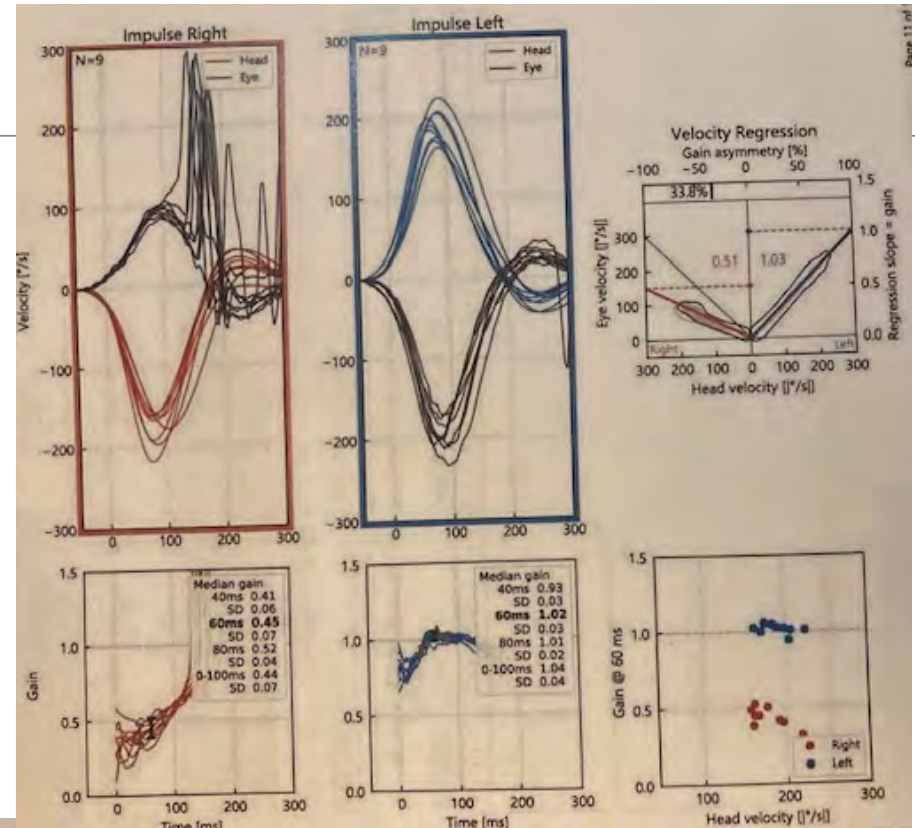
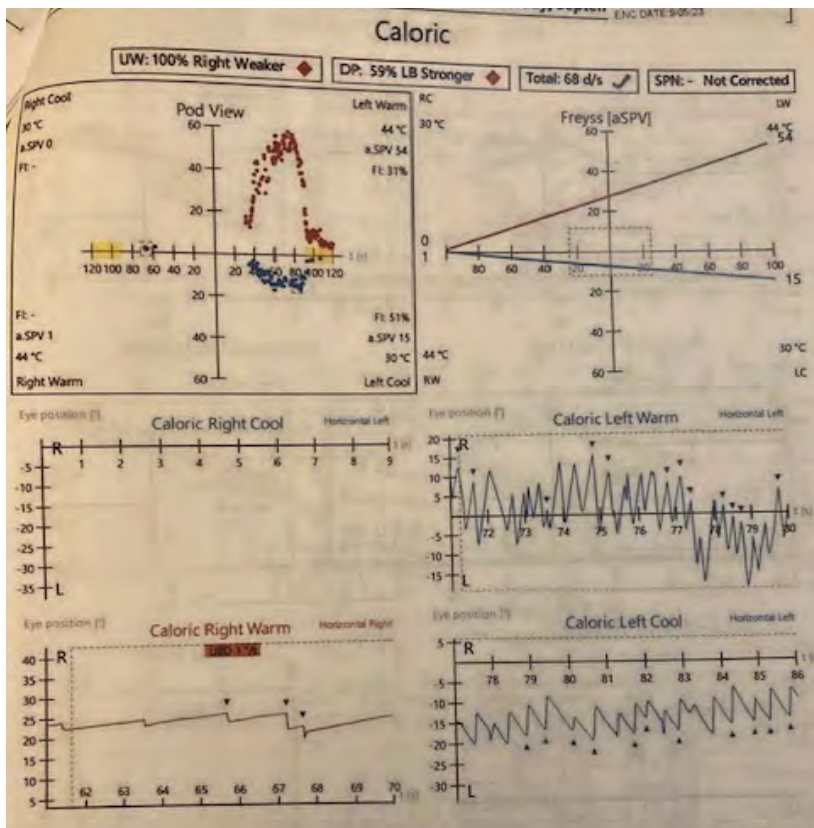
Special Case- Case 5 “Faith”

- 66y/o female
- History of vertigo dating back 7-8y
 - Evaluated at a specialty hospital and attributed to optic nerve aneurysms
- Physical therapy and acupuncture helped
- Over the last 6mo, vestibular and headache symptoms have returned
- Vestibular symptoms:
 - Feeling unsteady, illusion of spinning, oscillopsia, brain fog, fatigue, light sensitivity
 - Super market syndrome
 - Sensation lasts minutes to hours
- Migraine symptoms:
 - 7mo daily headaches
 - Significant history of migraines
- Triggers: busy environments, riding in the car, intense concentration
- Reduced activity as a result

Working diagnosis at the time of referral was vestibular migraine...



- Test battery:
 - Oculomotor- normal
 - Positional Assessment- normal
 - cVEMP- normal amplitude ratio symmetry, frequency tuning ratios and amplitudes- low threshold RIGHT
 - vHIT
 - Caloric Irrigation



Patient opted to discontinue testing prior to rotary chair

What are we looking at?

- General body of results:
 - Significant right peripheral vestibulopathy
 - Normal central vestibular function
- Clues about compensation status:
 - Spontaneous nystagmus
 - Directional preponderance
 - Saccades on vHIT
- What are her symptoms compared to those who are well compensated?

Ok so...Does she meet diagnostic criteria for vestibular migraines?



A) At least 5 episodes with vestibular symptoms of moderate/severe intensity, lasting 5min-72hrs

Minutes to hours long episodes of vestibular symptoms daily to weekly for 6mo



B) Current or previous history of migraine with or without aura per ICHD-3

Yes, history of migraines that resolved, return of head pain with light sensitivity and visual motion sensitivity 6mo ago



C) 1+ migraine features with at least 50% of vertiginous episodes

1- Moderate to severe head pain
2- Light sensitivity
3- Aggravated by daily routine



D) Not better accounted for by another vestibular or ICHD diagnosis

Vestibular function test findings *are*, but symptomatology is not

What's the deal with the vestibulopathy then?

- Comorbid presentation of vestibular neuritis and vestibular migraines
 - Vestibular neuritis onset was 8y ago and she recovered
 - Vestibular migraines onset 6mo ago
- How does this all combine?
 - Return of her headaches may have caused decompensation of the older lesion and comorbid presentation of vestibular migraines

What should she do?

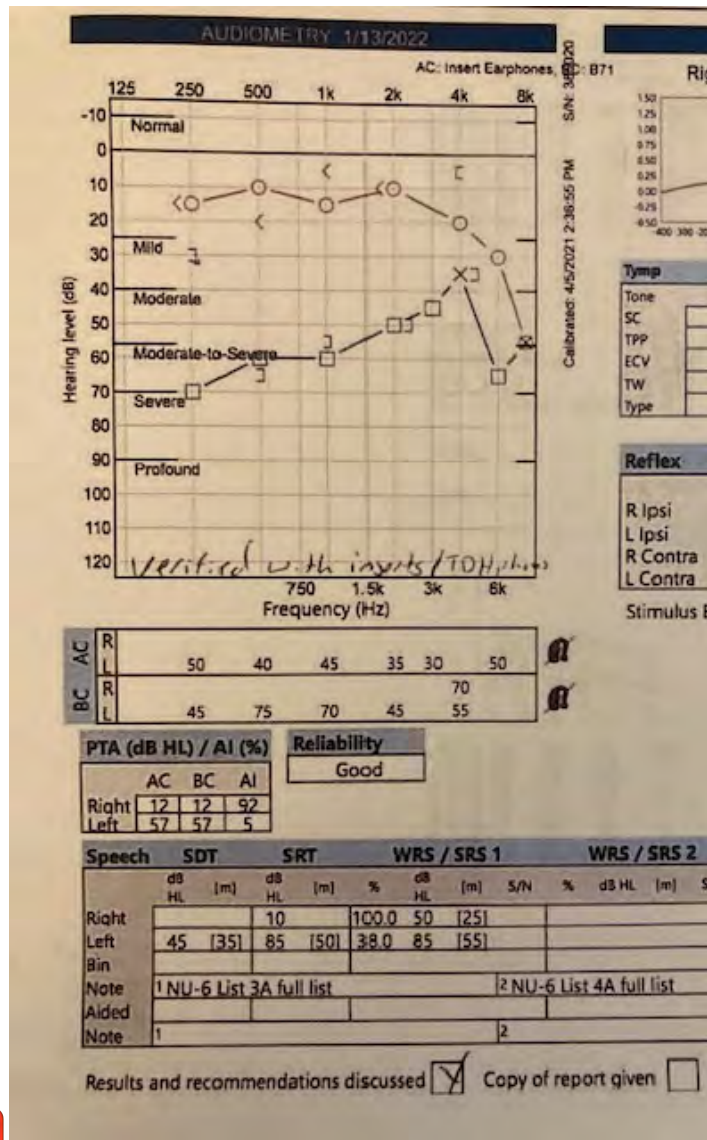
- Manage the predominant symptom source- migraines
- If symptoms aren't well managed, consider returning to physical therapy
 - More dynamic and cognitively difficult
 - Habituation (3)
 - Target symptom triggers

Special Case- Case10 “Barbara”

- 51y/o female
- Vertigo onset 10mo prior to visit
- Longstanding history of gradually asymmetric sensorineural hearing loss (worse left)
- Significant headache history, neurologist does not believe they are migraines
- Medical history includes heart attack at 39y/o
- Vestibular symptoms:
 - Two types of episodes:
 - Mild: occur 2-3x/ week lasting 20-30 minutes
 - Severe: occur ~monthly lasting up to an hour
 - Nausea, vomiting, visible nystagmus, spinning sensation, imbalance, brain fog, disorientation
- Migraine symptoms:
 - Temporal head pain, light and sound sensitivity, pulsing quality, aggravated by daily routine
- Otologic symptoms:
 - None with episodes of vertigo/headache

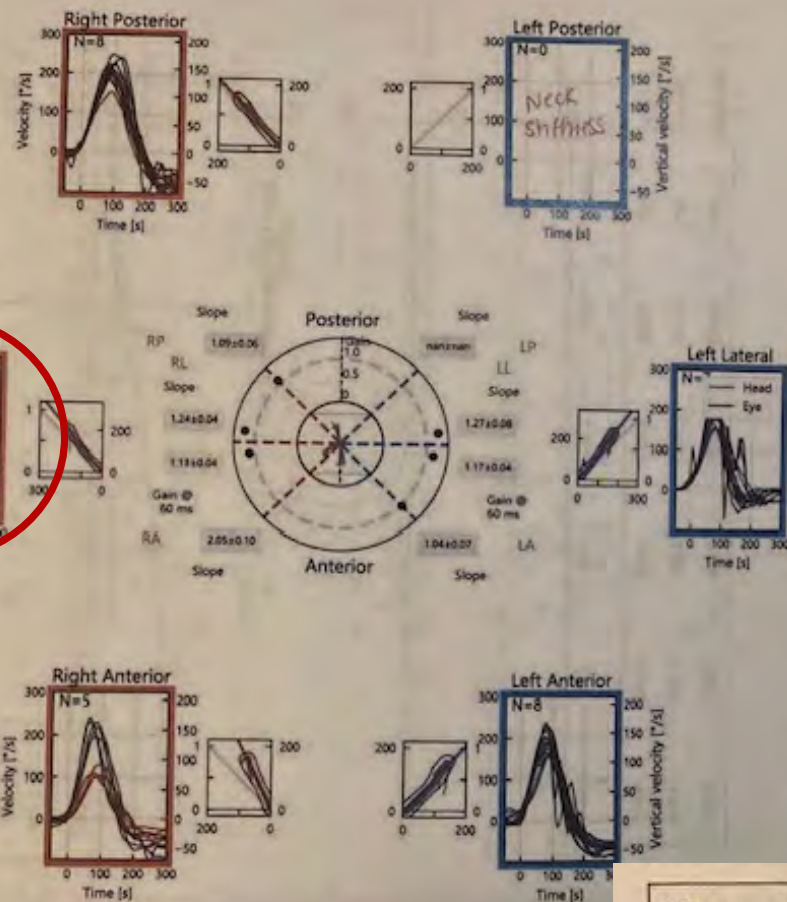
Differential diagnosis at the time of referral was vestibular migraines and/or probably Meniere's Disease

Case 10- “Barbara”



Test battery included:

- Oculomotor studies- normal
- Positional assessment- normal
- vHIT
- cVEMP Meniere's Protocol
- Caloric Irrigation
- Sinusoidal Harmonic Acceleration



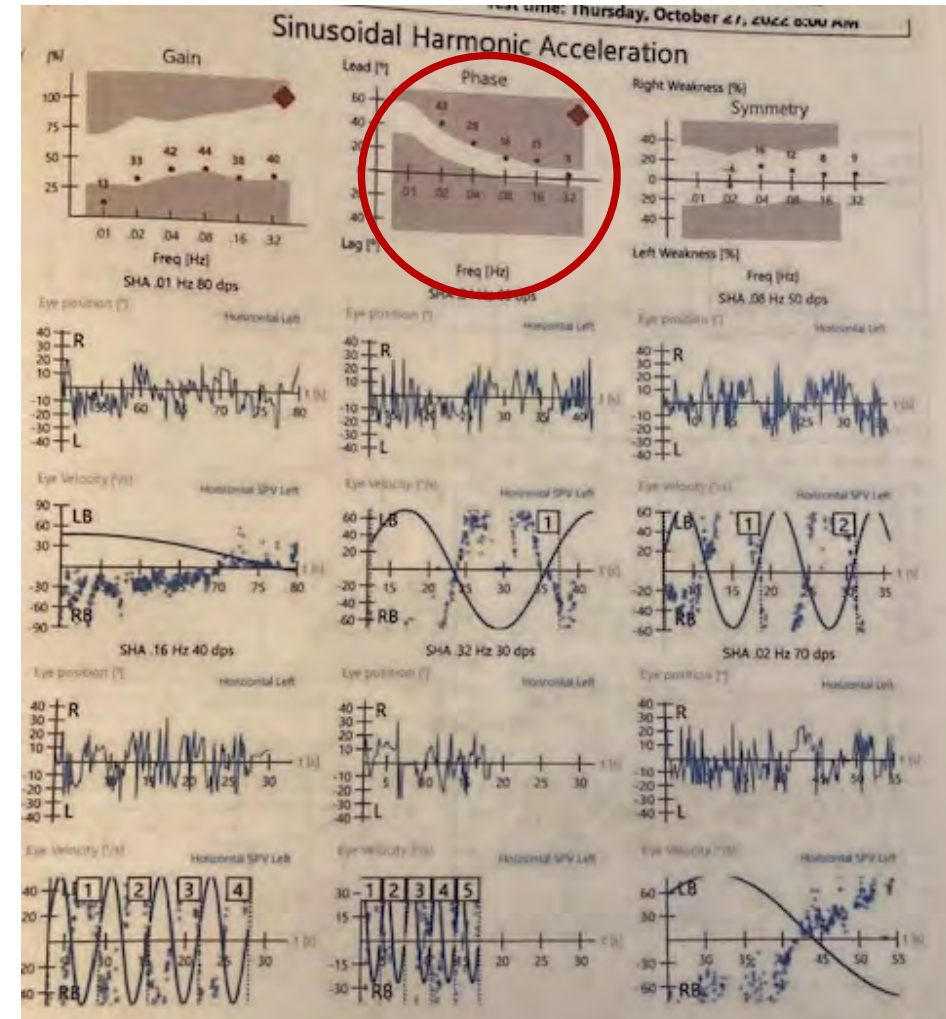
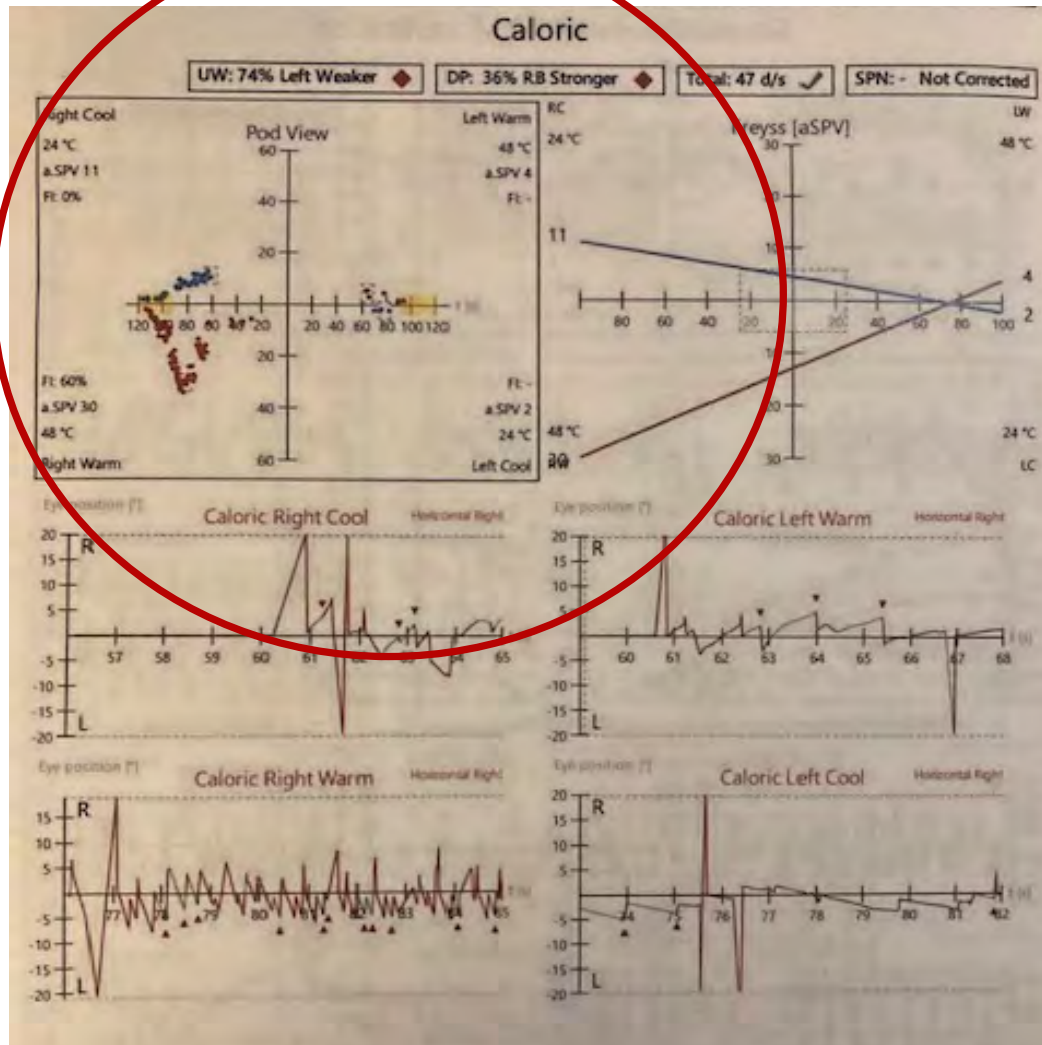
Case Studies

500Hz	Amplitude	P1 Latency	N1 Latency	Response at 97dBnHL	Response at 70dBnHL	Threshold
Right Ear	40.45µV	15.67ms	23.67ms	Present	Absent	97dB
Left Ear				Absent	Absent	NR at 97dB

Amplitude Asymmetry Ratio: 100% weaker in the left ear (<40% within normal limits)

750Hz	Amplitude	P1 Latency	N1 Latency	Response at 97dBnHL	Response at 70dBnHL	Threshold
Right Ear				Absent	Absent	NR at 97dB
Left Ear				Absent	Absent	NR at 97dB

1000Hz	Amplitude	P1 Latency	N1 Latency	Response at 97dBnHL	Response at 70dBnHL	Threshold
Right Ear				Absent	Absent	NR at 97dB
Left Ear				Absent	Absent	NR at 97dB



What are we looking at?

- General body of results:
 - Significant left peripheral vestibulopathy, normal vHIT
 - Normal central vestibular function
- Clues about pathology:
 - vHIT versus Calorics versus sinusoidal harmonic acceleration

Ok so...Does she meet diagnostic criteria for vestibular migraines?



A) At least 5 episodes with vestibular symptoms of moderate/severe intensity, lasting 5min-72hrs

Minutes to hours long episodes of vestibular symptoms weekly for 10+mo



B) Current or previous history of migraine with or without aura per ICHD-3

No current diagnosis, but may meet criteria



C) 1+ migraine features with at least 50% of vertiginous episodes

1- Moderate to severe head pain
2- Light and sound sensitivity
3- Aggravated by daily routine
4- Pulsating quality



D) Not better accounted for by another vestibular or ICHD diagnosis

Vestibular function test findings *are*, but symptomatology is not entirely

What's the diagnosis then?

- Comorbid presentation of vestibular migraines and Meniere's Disease of the left ear
- How does this all combine?
 - Hearing loss preceded vertiginous attacks and may be explained by cochlear hydrops
 - No otologic symptoms where hearing no longer fluctuates
 - Likely worsening symptoms meet criteria for migraines

Meets diagnostic criteria for both vestibular migraines and Meniere's disease with migraine symptoms presenting with more dominance.

What is the treatment plan?

- Manage the predominant symptom source and start conservatively
 - Trialed migraine supplement without success
 - Continued to have severe episodes of vertigo every 2 weeks, mild episodes more frequently lasting a few minutes and more frequent headaches
 - Intratympanic dexamethasone injection to target symptoms of Meniere's Disease
 - Severe episodes resolved thereafter, only mild episodes with shorter duration
 - Trialed sertraline, referral back to neurology
 - Significantly improved more mild symptoms

Wrap up

- Vestibular migraine patients are likely to account for a high number of referrals to dizzy clinics
 - At times non-specific symptoms, rule out other pathologies
- Case history alone is enough to determine if diagnostic criteria is met
 - No vestibular test battery used to diagnose VM
- Comorbid possibilities are seemingly endless and may complicate symptomatology
- Treatment options work to target dominant layer of symptoms first.

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Questions?

Thank you!