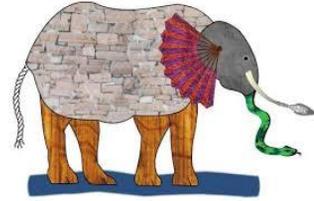


## Beyond the VNG and Team Approach Part II

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Arizona Balance & Hearing Aids

### Misconceptions

Dizziness is always due to a single cause



Result: Lack of coordinated team approach

## What Should We Do?

- To appropriately manage your dizzy patient, a multi-disciplinary approach, in my opinion, is required to manage symptoms as well as to determine when to return patient to normal activities.
- Physical therapists
- Occupational therapists
- Physicians
- Optometry
- Audiology
- Speech Language Therapist

## We Are Family.... Multi-Disciplinary Team Approach

- Dizziness, imbalance and ringing are among the most commonly-reported symptoms following TBI
- Dizzy patients often demonstrate increased recovery duration and poorer long-term prognosis
- Many TBI patients do not report tinnitus immediately following the injury, but may up to six months post injury
- Tinnitus and ringing is also commonly reported with patients who have sustained a TBI

## Do You Hear What I Hear?

- Comprehensive Audiogram
  - Air and bone conduction
  - Speech testing
  - Ultra high frequency testing
- Immittance testing
  - Ipsilateral and Contralateral acoustic reflexes

## Carole of the Bells

- Pitch matching
- Tinnitus masking
- High frequency Distortion Product Otoacoustic Emissions
- Tinnitus therapy
- Tinnitus maskers

## Huh, Whatcha Say?

- Speech in noise testing to screen for Auditory Processing Disorder
- Amplification for those with hearing loss secondary to TBI
- Assistive listening devices

## Grand Central Station

- Ocular motor testing is most sensitive to central lesions secondary to mTBI
- Want to get good recordings in as much darkness as possible
- Fixation for gaze testing and spontaneous testing gives tester a lot of good information
- OPK/OKN while is one of the weakest tests of battery it is very useful in determine vestibular migraines vs motion intolerance. FULL FIELD IS BEST!

## What we've learned so far...

64

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### The Diagnostics

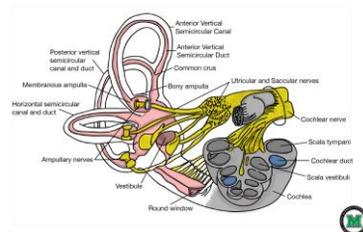
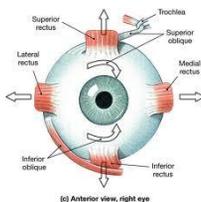
"The Eyes Tell All"

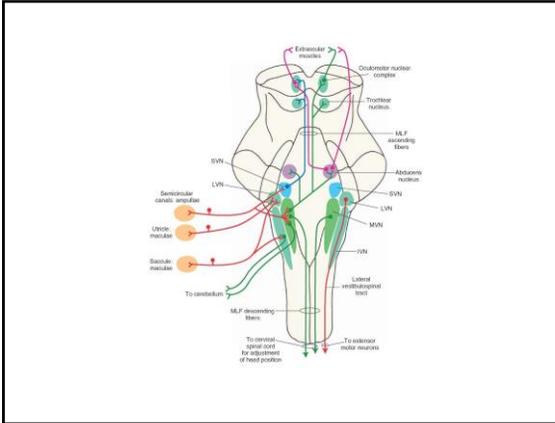


- Alignment
- Convergence
- Gaze
- Oculomotor Control
- Positional Testing
- Dynamic Vision

## Neurophysiology Facts

- Eye Movements
- Pupil Size and Reactivity
- Ptosis





- Acute Phases – (+) gaze and/or oculomotor
  - More conservative approach and ensure CNS pathology has been ruled out
  - Classic peripheral vestibular then treat accordingly with vestibular rehabilitation
- Chronic Phases – (+) gaze and/or oculomotor
  - $\geq 10$  days adults;  $\geq 21$  days adolescents
  - Proceed with therapy – visual retraining and/or vestibular rehab as deemed appropriate

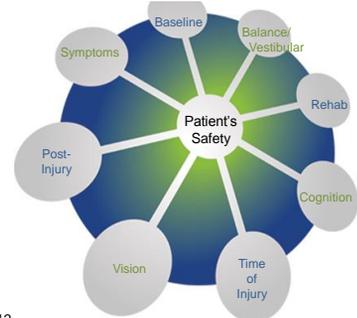
## What we know....

- Acute Phases – (+) positional testing
  - More conservative approach if central patterns and ensure CNS pathology has been ruled out
  - Classic peripheral vestibular then treat accordingly with vestibular rehabilitation (repositioning maneuvers, exercises)
- Chronic Phases – (+) positional testing
  - $\geq 10$  days adults;  $\geq 21$  days adolescents
  - Proceed with therapy – repositioning maneuvers and/or vestibular rehab as deemed appropriate

## What we've learned so far...

71

### Best Practices



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## Fallen For You

- VNG – Videonystagmography to evaluate the central and peripheral pathways
- Testing for Benign Paroxysmal Positional Vertigo
- VEMP Testing
- Rotary Chair

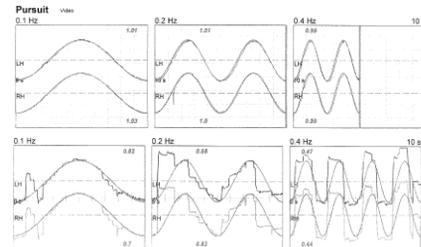
## Rollin Down The River

- Dix Hallpike testing to rule out BPPV
  - Determine canal involvement
  - Don't be surprised with multicanal
- Positional testing to look for central vs peripheral
  - Also helps with compensation
- Fixation a MUST!
  - We sometimes forget this step, but it is important in determining central vs. peripheral

## Water boarding- Audiology Style

- Caloric testing
  - Measures only horizontal canals
  - Low frequency testing
  - Currently the “gold standard”
  - Water vs. Air Calorics
  - Tests ears independent of another

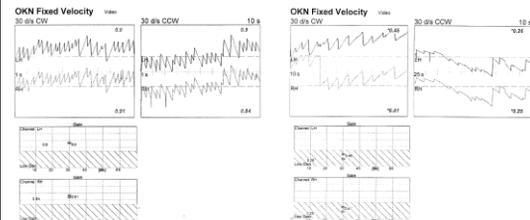
## Normal vs. Abnormal: Pursuit



## Normal vs. Abnormal: Saccades



## Normal vs. Abnormal: OKN



## Sample Cases

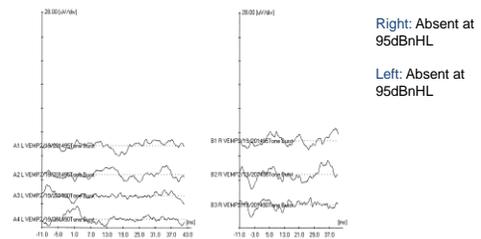
### Case 1: History

- Patient fell at work and hit forehead
- 3-4 days later reported dizziness and nausea
- 1-2 weeks later reported constant subjective tinnitus
- Currently reporting headaches, head pressure, lightheadedness, and floating sensation
- Feels better when laying down
- Difficulty driving, rarely drives now
- Seen at ABHA on 2-7-2014

## Case 1: VNG

- Ocular Motors: WNL
- Positionals: 2 deg/sec geotropic nystagmus in five positions that fixated with vision.
- Calorics: WNL
  - 10% right caloric weakness
  - 14% left directional preponderance
  - Note: Significant nausea and vomiting following each irrigation.
- Recommended:
  - oVEMP
  - cVEMP

## Case 1: cVEMP



## Case 1: Summary

- Significant nausea/vomiting reaction following caloric irrigations
- Present oVEMP
- Absent cVEMP
- **Finding:** Inferior nerve abnormality affecting the normal VOR function

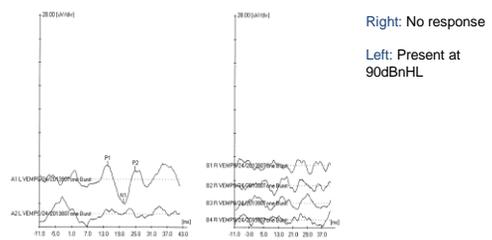
## Case 2: History

- Woke up May 2013 with spinning sensation
- Visited Mayo Clinic and negative for Dix-Hallpike
- Rx: Meclizine for 3 days and physical therapy at SHC
- History of ear surgery, panic attacks, and hearing loss
- Reports ears feeling full and feels eyes moving
- Tinnitus in left ear only
- Profession: dance teacher
- Seen at ABHA on 9-24-2013

## Case 2: VNG

- Ocular Motor: WNL
- Positionals: 3-10 deg/sec left beating nystagmus that did not suppress with fixation.
- Calorics:
  - 28% right caloric weakness
  - 33% left directional preponderance

## Case 2: cVEMP



### Case 3: History

- 11 Year old, female
- 1-13-2014 at school in PE and became very dizzy
- **Note:** Grandmother passed away almost exactly one year ago
- Woke up next day and felt a spinning sensation and nausea
- No hearing loss reported
- Went to ER and Dx: Labrynthitis
- PCH: MRI was normal
- Neurology: Normal findings
- Sways when walking and standing
- Referred to SHC for physical therapy
- Seen at ABHA on 2-19-2014

### History continued

- VNG was done at local ENT office and read as bilateral vestibular loss
- Patient placed on high dose steroids when seen in our office this was second round of steroids, which the patient had been on for 7 weeks at the time of testing. (Prednisone 30 mg BID)
- Mother visited PT at SHC once then took daughter to BCC. The PT referred her to ABHA for further testing.

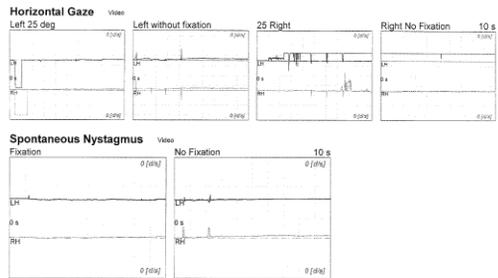
### Outside VNG Report

**Results:**

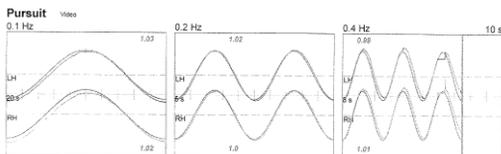
There was no gaze or spontaneous nystagmus. Tests of oculomotor screening were within normal limits. There was no clinically significant positional nystagmus. The Dix-Hallpike maneuver was performed twice bilaterally with no evidence of BPPV.

Bilateral, bihermal tests of caloric irrigation were performed and yielded the following results which indicate a bilateral weakness. Bilateral ice calories were performed showing a weak response in both ears.

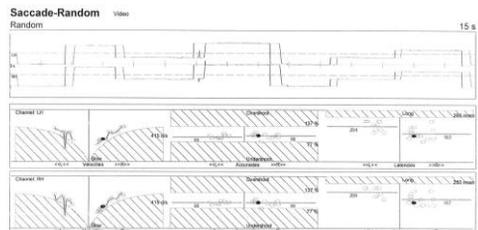
### Case 3: Horizontal and Spontaneous



### Case 3: Smooth Pursuit

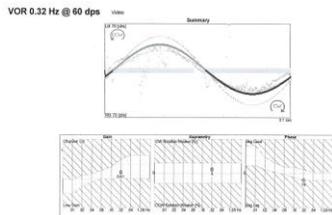


### Case 3: Saccades

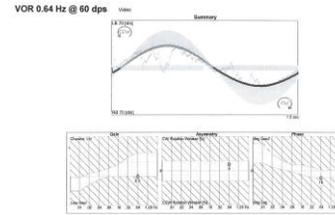




### Case 3: Rotary Chair



### Case 3: Rotary Chair



### A few more clues...

### Case 4: History

- 59 y.o. female referred to ABHA by her physical therapist for dizziness that has been going on since 1988-1989
- Patient reports experiencing vertigo at least once a week for that year and then one and off after 1989
- Symptoms returned 2 weeks ago

### Case 4: History continued

- Positive history for diabetes, joint replacement, and abnormal heart rhythm
- Patient reports a spinning rotation, poor balance, head fullness, free falling, and the feeling like she is going to fall
- Dizziness is intermittent and she experiences mostly when turning over in bed, rolling over, or looking up

### Case 4: Additional History

- Is being treated for BPPV by physical therapy
- Currently on dialysis for kidney failure
- Physical therapist wanted to join her for visit but was unable to attend

<b>Static:</b>	Within normal limits, however poor target stability was noted.
<b>Static/Positional (Horizontal):</b>	Within normal limits, however poor target stability was noted.
<b>Static/Positional (Vertical):</b>	Symmetrical.
<b>Dynamic/Static:</b>	Small saccuscular jerks that increased slightly in amplitude without fixation.
<b>Dynamic/Static:</b>	No significant gaze evoked nystagmus.
<b>Dynamic/Static:</b>	Positive for both left and right maneuver.
<b>Dynamic/Static:</b>	21 deg/s left beating torsional nystagmus during left Dix-Hallpike (duration: 15 seconds). 19 deg/s right beating torsional nystagmus during right Dix-Hallpike (duration: 15 seconds).
<b>Static/Positional:</b>	No significant nystagmus during static positioning. Notably, 64 deg/s right beating nystagmus was recorded when patient rolled from body left to body right that lasted about 30 seconds.
<b>Dynamic/Static:</b>	Abnormal. 33% right caloric paresis, 7% left directional preponderance. Caloric vestibular responses: RC 2, LC 4, RW 3, LW 6 deg/s.
<b>Video Observations:</b>	Video observations as per the positional findings above.

**SUMMARY:** This patient's infrared video nystagmogram is abnormal due to 1) right and left torsional nystagmus during right and left Dix-Hallpike maneuver, respectively, 2) 64 deg/s right beating nystagmus that lasted for about 30 seconds when the patient rolled over from body left to body right position, and 3) bilateral caloric weakness with right greater than left. Poor visual stability may also relate to her history of diabetes and hemodialysis treatment and medications. Torsional right and left Dix-Hallpike Maneuver indicates a position for benign paroxysmal positional vertigo (BPPV) in the right and left posterior canal and the onset of the 64 deg/s right beating nystagmus when the patient rolled over to her right side indicates BPPV affecting the horizontal canal. The bilateral caloric weakness indicates a bilateral peripheral vestibular weakness with the right side weaker than the left. Canalith repositioning maneuver (CRM) was performed today to treat the BPPV. It is recommended that the patient return for ice water caloric testing to confirm the bilateral weakness if her symptoms of vertigo persists after CRM treatment.

### Case 4: Teamwork

- Physical therapist has spent 2 days at ABHA learning more about balance testing, what we look for and things to consider when treating his patient base
- I in turn have learned a lot from him on the patients he sees and how we might better serve their hearing and balance healthcare needs

### Bringing It In For A Landing

- Within the team of physicians, therapists, neuropsychologists and more the audiologist can provide the needed information and documentation of balance dysfunction as well as abnormal vestibular reflex pathways that may hinder recovery.



### Questions ????

