

**March 19, 2015**  
**Newport Beach, CA**

# **Vertigo Workshop**

## **Mike Valdez, PA-C**

*Updated 2/9/2015*

# Vertigo Workshop



Clear  
Instruction



Live  
Demonstration



Hands-On  
Practice

*Learn by doing*

Vertigo examination

Rhomberg Test

Demonstration ENG/VNG

Neurological examination

Fukada Stepping Test

Canalith Repositioning

# *Introduction*

There are multiple methods and techniques available to successfully complete all the topics presented in this workshop. Some are based on patient request, available equipment or supervising physician's preference.

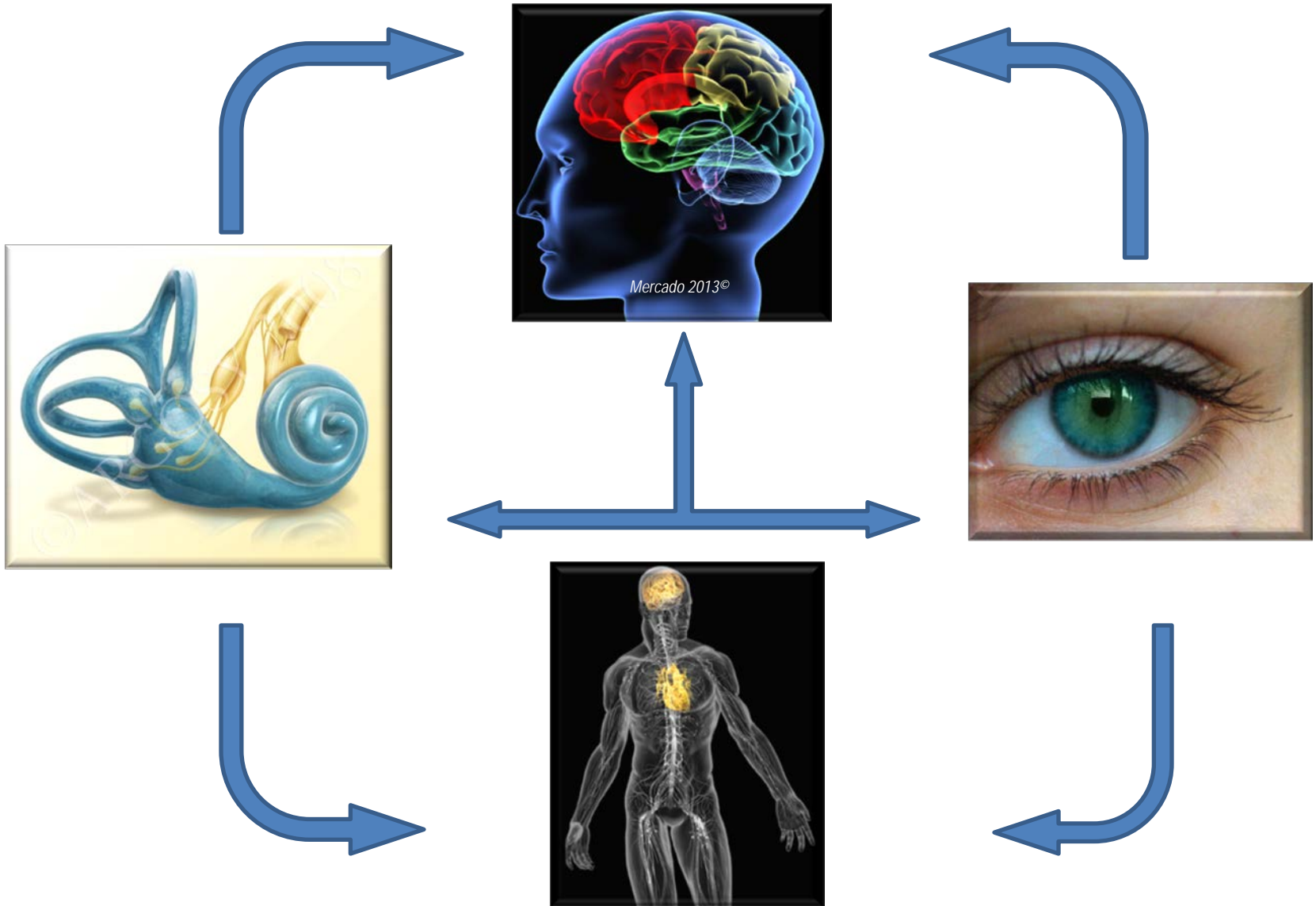
The goal of this workshop is to correctly demonstrate the most common methods and give participants time for hands on training.

# *Vertigo Workshop*

## Learning Objectives

- Discuss and demonstrate vertigo examination;
  - Neurological examination
  - Romberg Test
  - Fukuda Stepping Test
  - Dix-Hallpike
- Demonstrate ENG/VNG.
- Demonstrate and practice canalith repositioning

# *Balance*

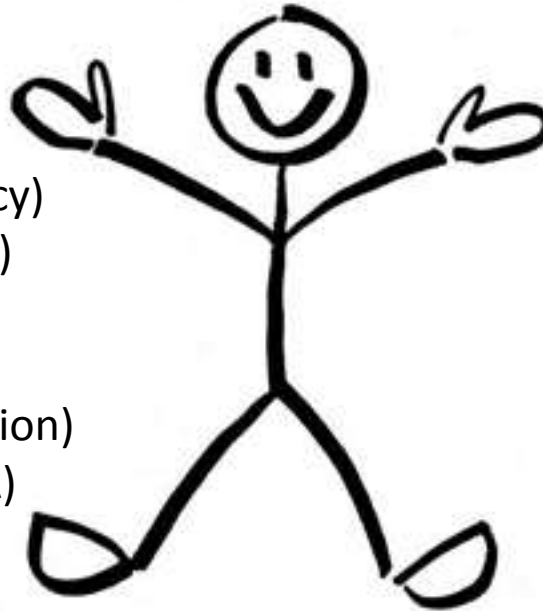


# *Clinical Evaluation of Vertiginous Patient*

## **Central**

Vascular disorders  
(Vertebrobasilar Insufficiency)  
(Vascular Loop Syndrome)  
Multiple Sclerosis  
CNS Neoplasm (tumor)  
Cardio (orthostatic hypotension)  
Cerebrovascular (CVA/TIA)  
Migraine

*Neurology/Cardiology*



## **Systemic**

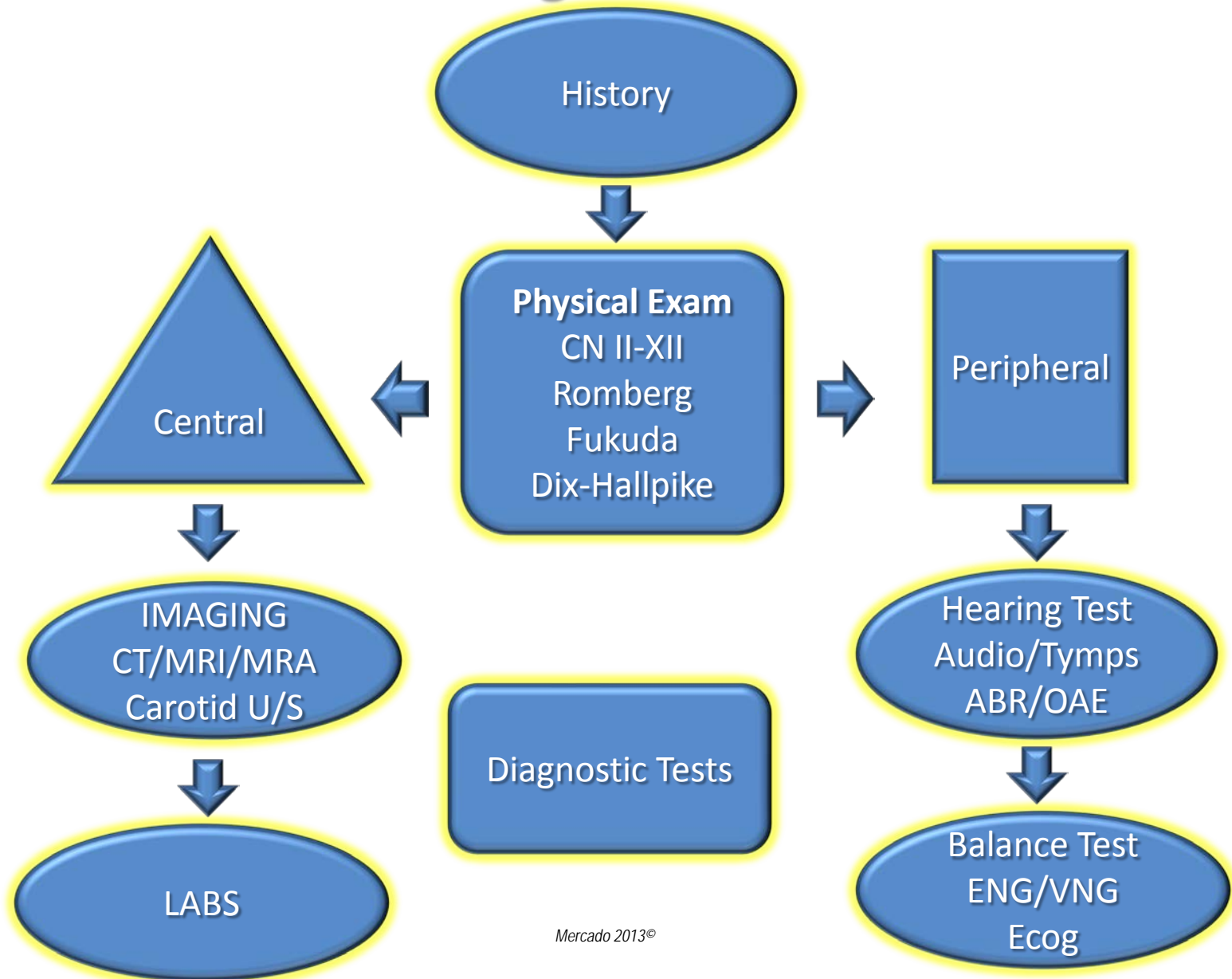
Medication  
Endocrine  
Disequilibrium

## **Peripheral**

Labrynthitis  
Vestibular Neuronitis  
BPPV  
Perilymphatic Fistula  
Meniere's Disease  
Autoimmune  
Ataxia

*Otolaryngology*

# Algorithm



# *Clinical Evaluation of Vertiginous Patient*

- History
- Physical examination
  - Pneumatic Otoscopy
    - Middle ear disease
    - Hennebert's Sign
  - CN II-XII
  - Romberg
  - Fukuda Stepping Test
  - Dix-Hallpike
- Diagnostic tests
- Goal is to Differentiate central vs. peripheral



# Peripheral

## Vestibular Neuritis

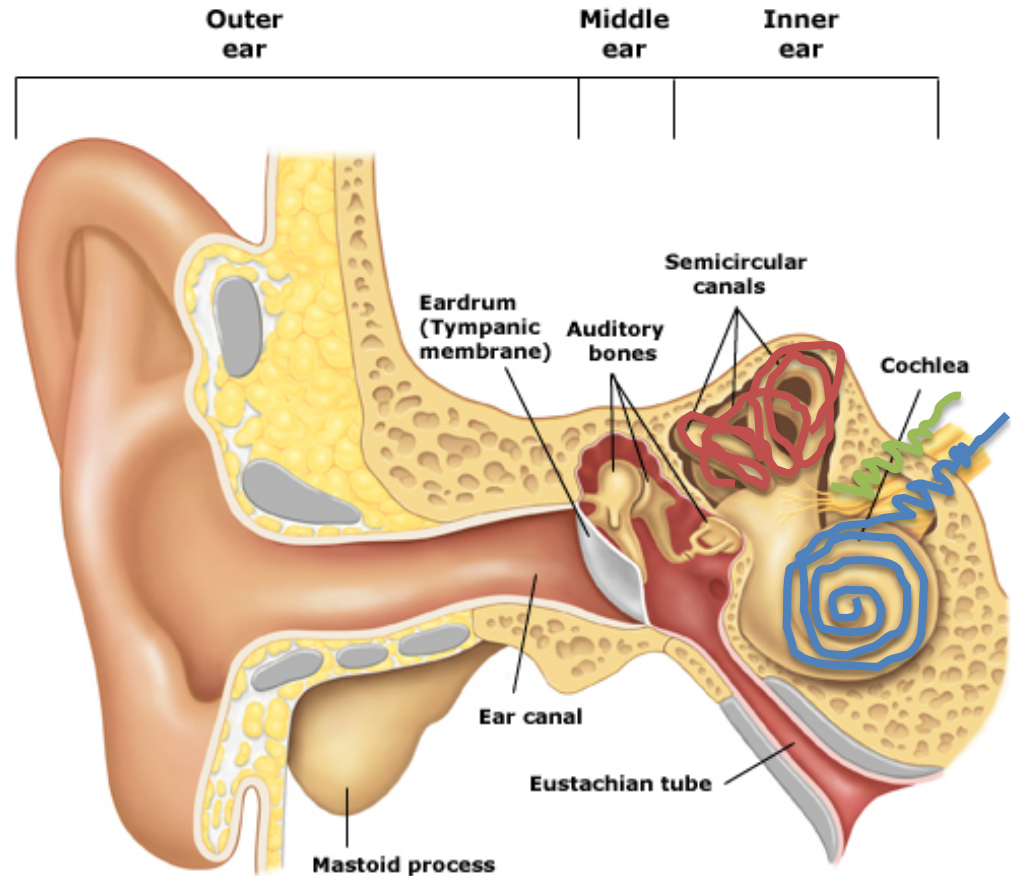
Dizziness/Vertigo  
Nausea/Vomiting

## Cochlear Neuritis

Ear Pressure /Full  
Hearing loss  
Tinnitus

## Labyrinthitis

Dizziness/Vertigo  
Nausea/Vomiting  
Ear Pressure /Full  
Hearing loss  
Tinnitus  
May be bacterial Very sick



# *Central*

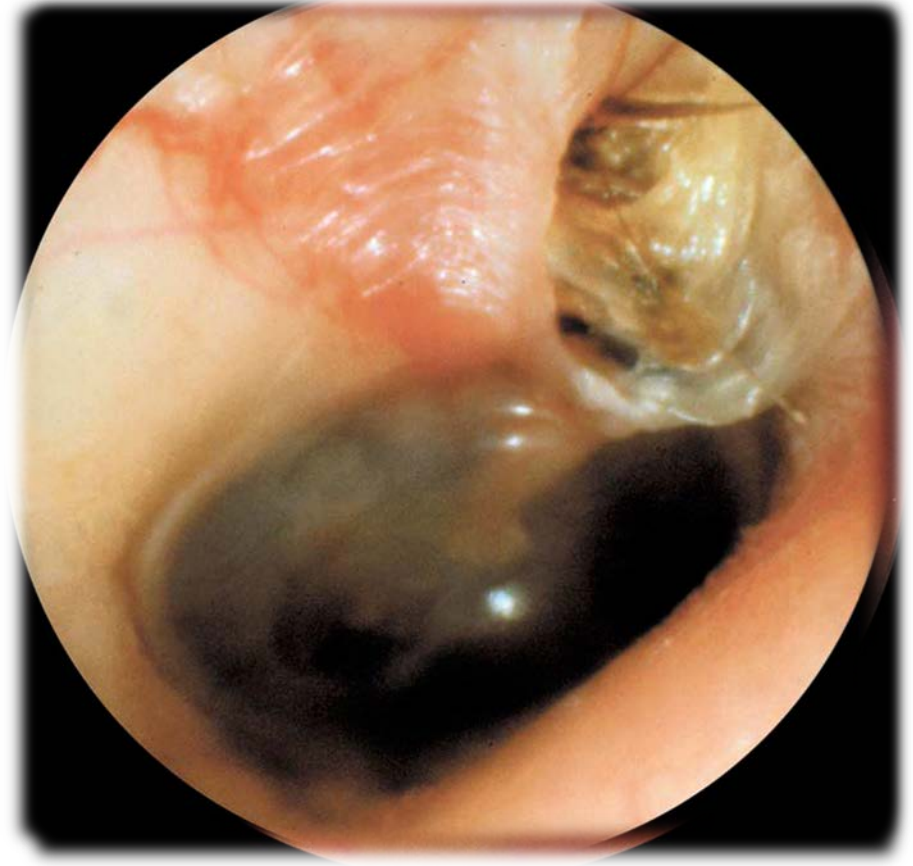
- Vascular disorders
- (Vertebrobasilar Insufficiency)
- (Vascular Loop Syndrome)
- Multiple Sclerosis
- CNS Neoplasm (tumor)
- Cardio (orthostatic hypotension)
- Cerebrovascular (CVA/TIA)



# *Physical Examination*

Visualize tympanic membranes;

- Infection
- Perforation
- Trauma
- Cholesteatoma  
/otorrhea.



# *Physical Examination*

Develop routine and systematic approach to dizzy patient.

Begin with brief neurological exam

- CN II – confrontation testing and ophthalmoscopic exam.
- CN III, IV, VI- extraocular movement (EOM)
- CN V – corneal reflex
- CN VII – facial strength & symmetry
- CN VIII – Webber/Renne audiogram
- CN IX – gag reflex soft palate
- CN XI – shoulder shrug
- CN XII – tongue protrusion

*Not a neurologist – looking for gross abnormalities*

# *Pneumatic Otoscopy*

- Hennebert's Sign – nystagmus and vertigo with +/- pressure
- Normally: No nystagmus
- May be positive in: Perilymph fistula, Semicircular canal dehiscence syndrome, and Meniere's disease





# Romberg Test

- Patient asked to stand with feet together and eyes closed
- Increased sway with eyes closed suggests inner ear problem
- Equal sway with eyes open and closed suggests CNS problem
- Fall or step is positive test (usually towards side of lesion)
- Positive usually posterior column disorder



**Romberg test**

# *Fukuda Stepping Test*

- Patients are asked to step with eyes closed and hands out in front
- 100 steps.
- Turn usually occurs to the side of the lesion
- Forward motion is often normal

*poor sensitivity and specificity.*



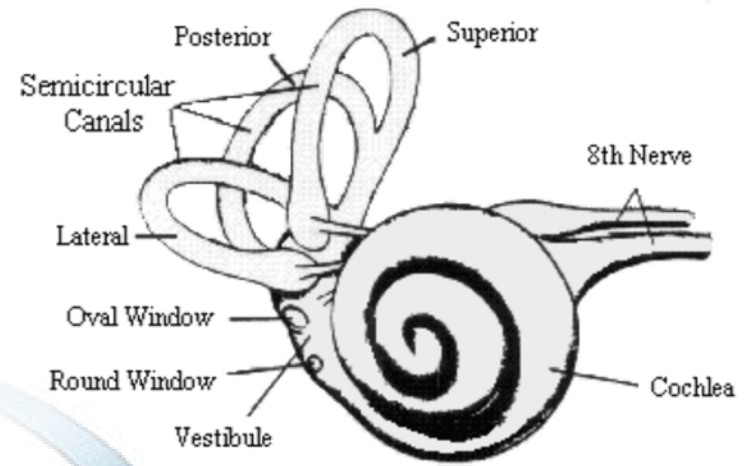
# *Tandem Gait Test*

- Patients are asked to walk heel to toe in a straight line or in a circle
- Complex function evaluates many aspects of balance
- Poor performance seen in **cerebellar lesions**, but can be seen in many disorders
- Poor sensitivity and specificity



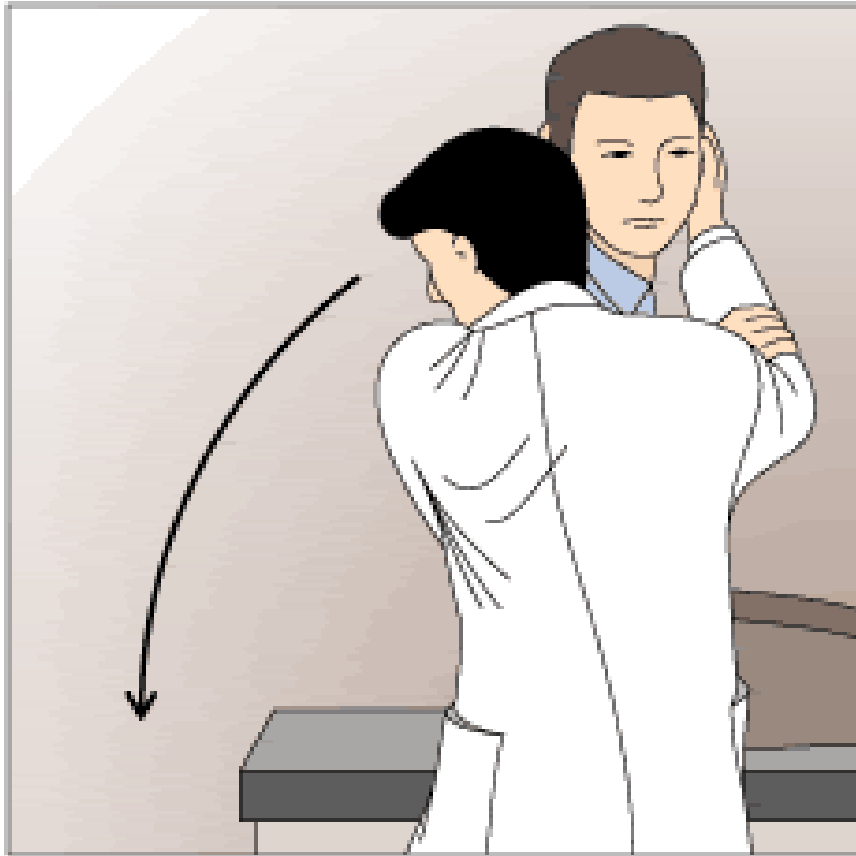


# Dix-Hallpike



# *Positional Vertigo*

- Dix-Hallpike Maneuver reproduces benign paroxysmal positional vertigo (BPPV) by stimulating hair cells.
- Majority of BPPV is posterior canal.
- Canalithiasis theory -Free floating debris (dislodged otoconia) in the endolymph of the posterior canal – inertial drag of endolymph causes displacement of the cupula resulting in latent vertigo which resolves when debris settles



- **Dix-Hallpike** – examiner stands to the side of the patient, who sits upright with head turned to examiner (LEFT). The patient is positioned so that when the body is supine, the head will extend **BEYOND** end of table. Consider a shoulder roll to provide adequate head-hanging.
- The examiner holds the head and moves the patient **RAPIDLY** from sitting to head hanging position. First with the head turned to one side, then the other. Once in the head hanging position, patients with BPPV will show a burst a burst of nystagmus after a delay of 5-10 seconds. Episodes last a few seconds (fatigueability).

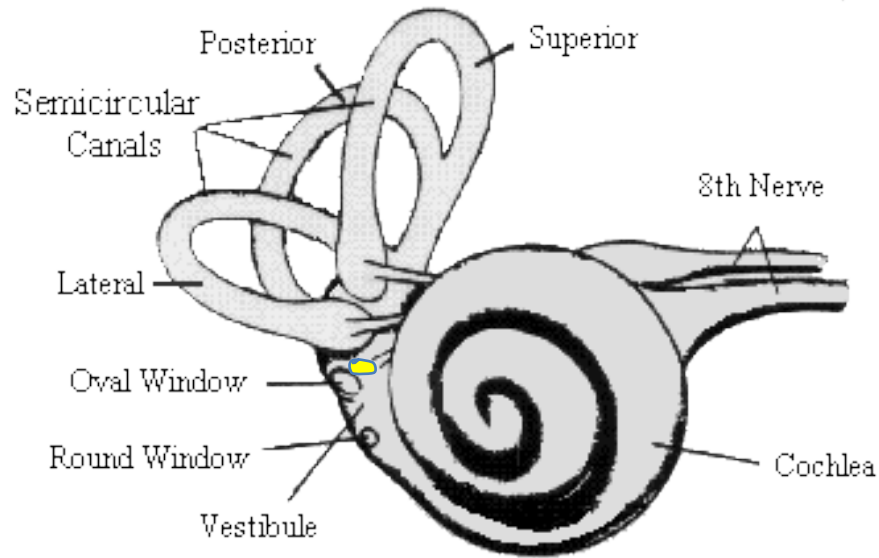
# Dix-Hallpike



## Demonstration Dix-Hallpike Maneuver



# *Canalith Repositioning*



If vertigo is reproducible with Dix-Hallpike Maneuver, patient requires canalith repositioning or Eply Maneuver.

## Modified Epley Maneuver

Patient's head is systematically rotated so that the loose particles slide out of the semicircular canal and back into the utricle.

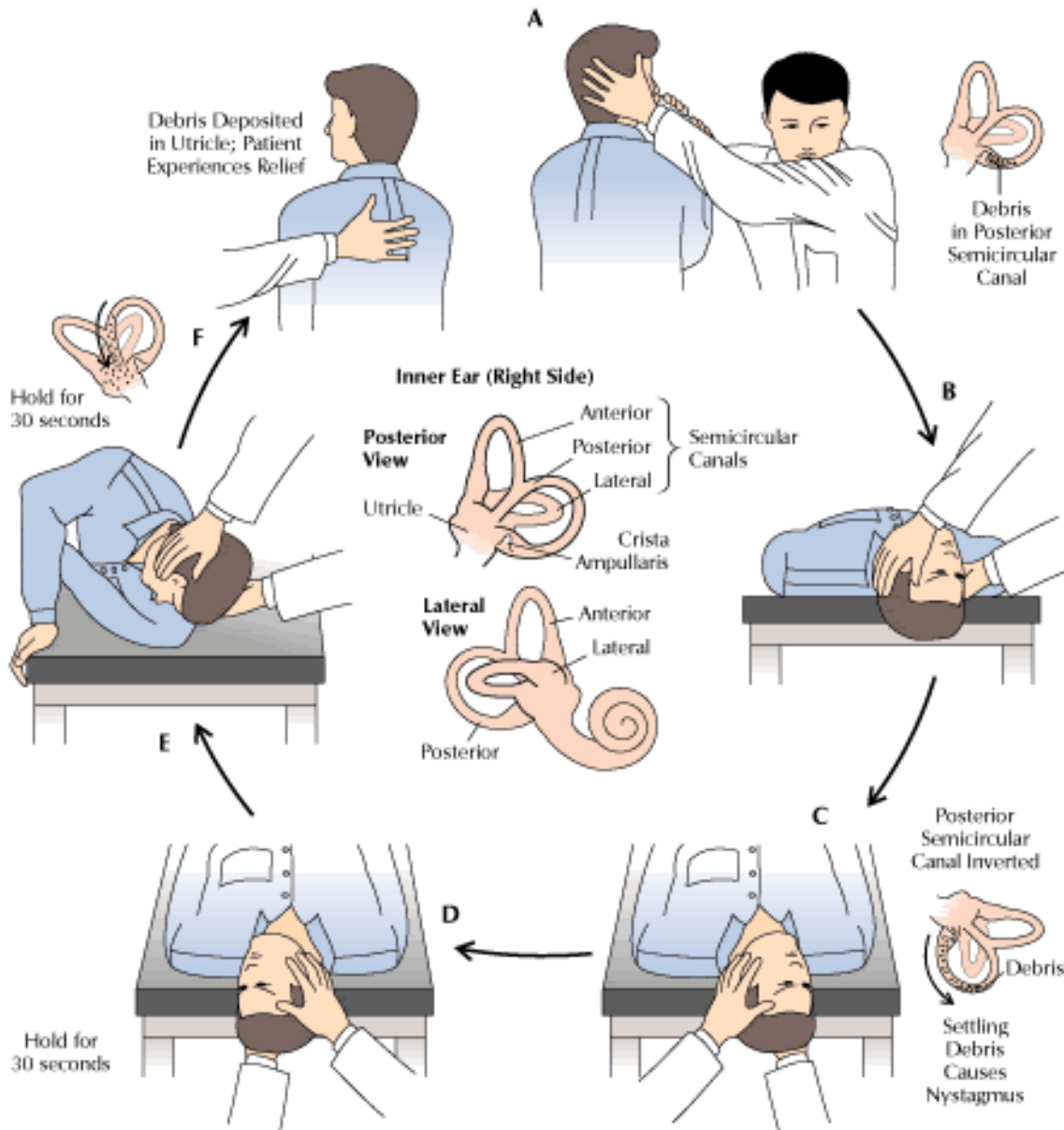
1. If vertigo affects **RIGHT** ear, the patient is brought to the head hanging position with right ear turned **DOWNWARD**.

2. Move the head to end of table, rotate head to the **left** with right ear turned **UPWARD**.

3. Hold for 30 seconds, then roll patient onto the **left** side while clinician rotates head **LEFTWARD** until the nose points down to floor.

4. Hold position for 30 seconds.

5. Then patients returns to sitting position with head facing **left**.





# Canalith Repositioning



## Demonstration Canalith Repositioning (Eply Maneuver)



# *Diagnostic Tests*

- Audiology: assess **Peripheral Vestibular System**
  - Hearing: Audiogram, otoacoustic emissions
  - Tympanogram
  - Electrophysiologic: Ecog, ABR, VEMP
  - ENG / VNG
  - Rotary Chair
  - Posturography
- Imaging: assess **CNS**
  - CT / MRI / MRA
  - Carotid US
- Blood Tests: assess **Systemic**



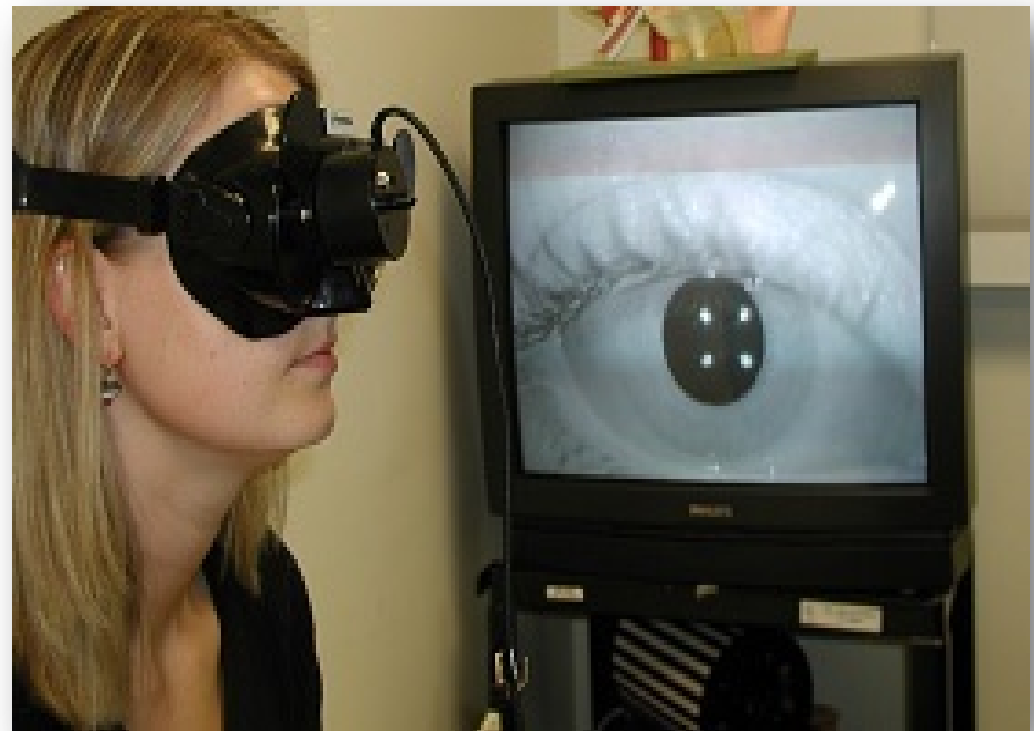
# Elements of Videonystagmography

Dr. Salvatore Gruttadauria, Au.D.  
Clinical Director-Balanceback

# *Electronystagmogram*

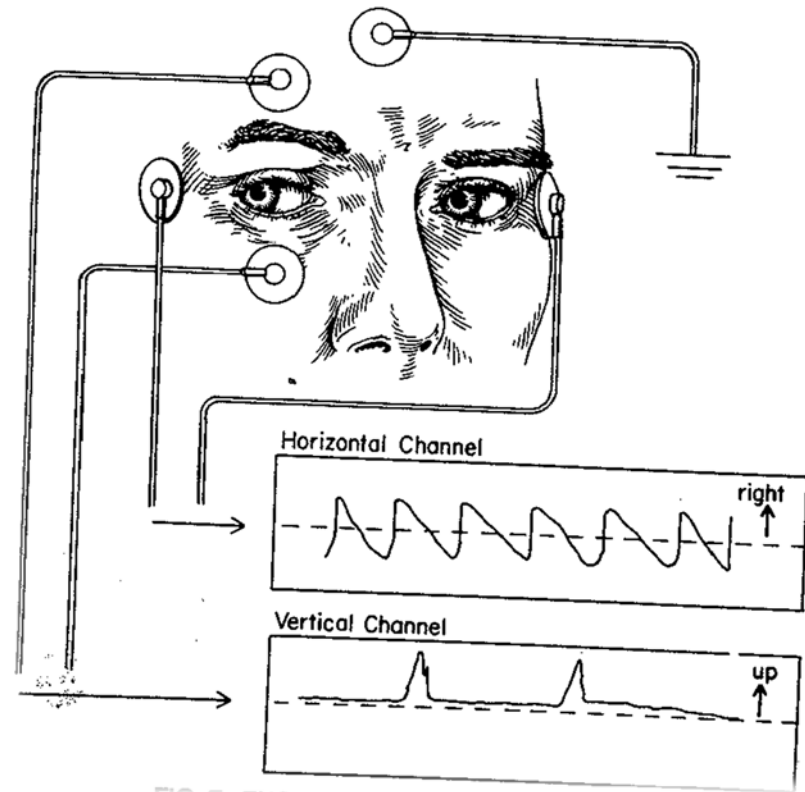
Electronystagmography (ENG), which includes caloric testing, is one of the most vital tests for evaluating the vertiginous patient. Helps differentiate central versus peripheral etiology and in addition in localizing the dysfunctioning ear.

ENG requires approximately 45 to 90 minutes.



# *Electronystagmogram*

- Records eye movements during series of positional changes, oculomotor testing, calorics
- Helpful in localizing lesion, confirming vestibular disorder present
- Not always diagnostic



# *Electronystagmogram*

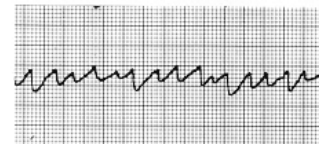
- An electrode is placed lateral to each eye with a ground electrode placed on the forehead.
- Because of the voltage differences between the cornea and the retina, eye movements can be graphed on a strip chart recording



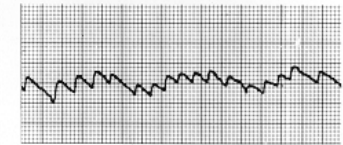
A Calibration



B Tracking



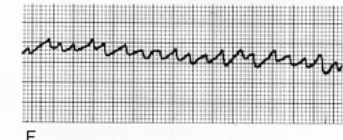
C R 30°  
(left=beating nystagmus)



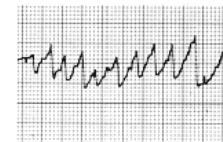
D L 30°  
(right=beating nystagmus)



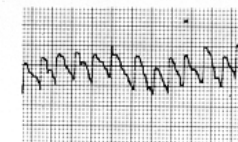
E R 44°  
(right=beating nystagmus)



F L 44°  
(left=beating nystagmus)



G OPK R  
(optokinetic nystagmus,  
tape moving right)



H OPK L  
(optokinetic nystagmus,  
tape moving left)

# *Frenzel Glasses*

Patient can often suppress nystagmus caused by a peripheral vestibulopathy by fixation.

Many of the vestibulo-oculomotor tests in the office examination can be performed with +20 lenses (i.e., cataract glasses), which prevent the patient from focusing on objects in the visual surround.



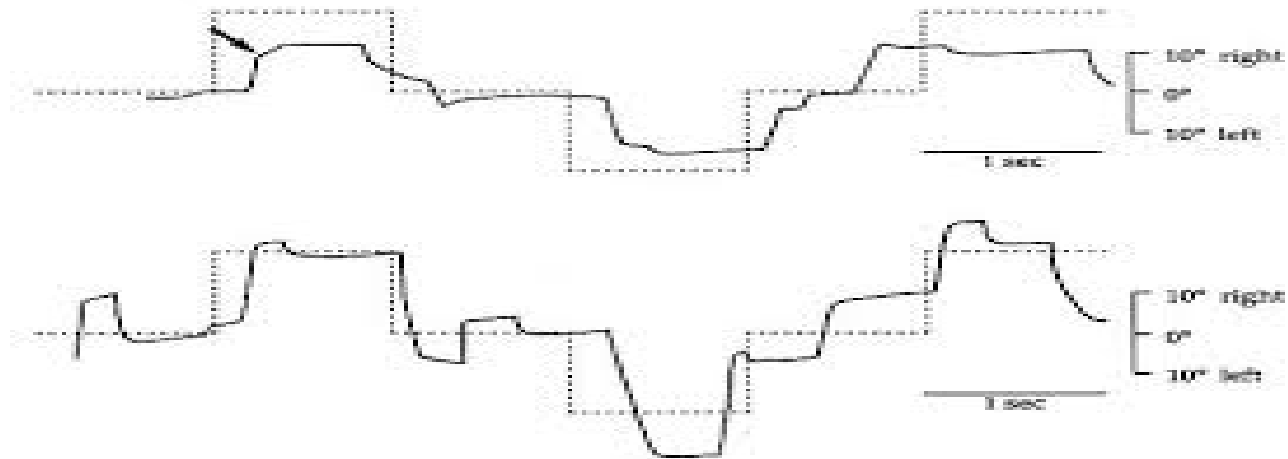
# Oculomotor Testing

Useful as cerebellar disorders and degenerative disorders of the central nervous system

- Saccades
- Smooth Pursuit
- Optokinetics
- Gaze

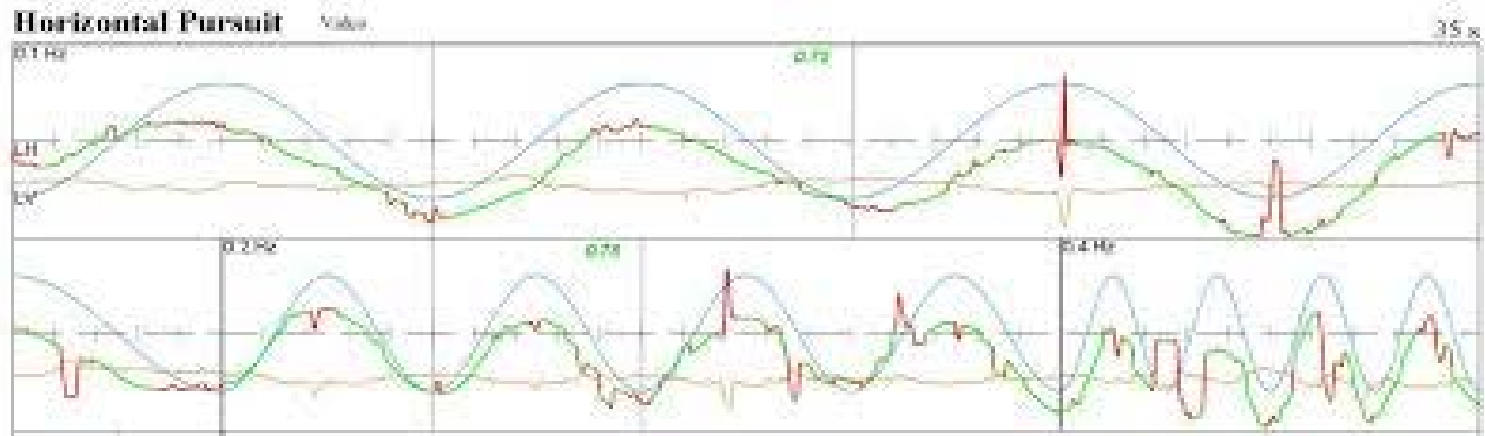
# Saccades

- Peak Velocity
- Accuracy
- Latency



# Smooth Pursuit

- The tracking test measures the ability of subjects to match eye movement to visual target movement



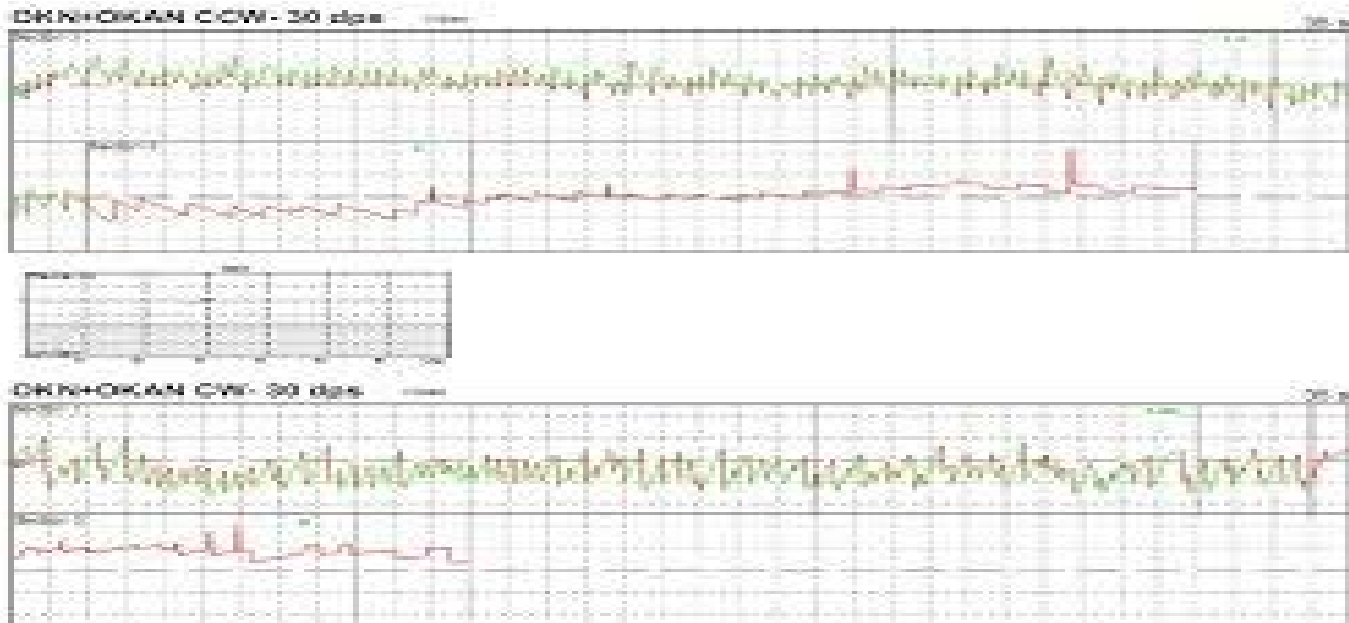


# Smooth Pursuit (Abnormal)



# Optokinetic Testing

- The eye movement elicited by the tracking of a moving field. It differs from smooth pursuit which is the eye movement



# Optokinetics



# Gaze Testing

Central and peripheral implications based on pattern of nystagmus observed during eye positions with and without fixation(vision)

- Gaze Right
- Gaze Left
- Gaze Up
- Gaze Down

Done with vision and in vision denied conditions

# High Frequency Headshake Test

- The head is shaken in the yaw plane for approximately 30 seconds.
- In normal subjects or persons with symmetrical vestibular loss (such as bilateral vestibular loss), no nystagmus is expected.
- In persons with a dynamic imbalance between the ears (such as due to unilateral vestibular neuritis or an acoustic neuroma), a nystagmus is often seen (usually beating towards the “better” ear).

# Positioning Tests

- Active movement
- Typically Dix-Hallpike but there are many variations
- Used to diagnosis BPPV



**Right side Dix-Hallpike**

# Positional Testing

## Static Test

- **Looking to see:** Does a change in gravitational orientation cause abnormal eye movement?
- Specifically looks at the Utricle and Saccule as our linear force detectors
- Supine, Head Right, Head Left, Body Right, Body Left, Body Right Headshake, Body left Headshake
- Done with vision and vision denied conditions



# Calorics

## Air

- Temperature Settings
  - 24 Celsius Cool
  - 50 Celsius Warm
- Length of Stimulation
  - 50-60 seconds

# Calorics

## Water

- Temperature Settings
  - 30 Celsius Cool
  - 44 Celsius Warm
- Length of Stimulation
  - 30 Seconds

# Calorics

## Limitations

- Looks only at the VOR at very low frequencies
- Tests the lateral/horizontal canals alone

# Calorics

- Allows us to compare two aspects
  - The strength of right ear versus left ear
  - The SPV of right beating nystagmus versus left beating nystagmus
- ***Unilateral Weakness***
- ***Directional Preponderance***
- ***Bilateral Weakness***

# Demonstration VNG



Fast, accurate and quantitative test that may be used to accurately diagnose balance disorders and differentiate between:

- Central Nervous System Disorders

- Vestibular Disorders

- Other Balance Disorders

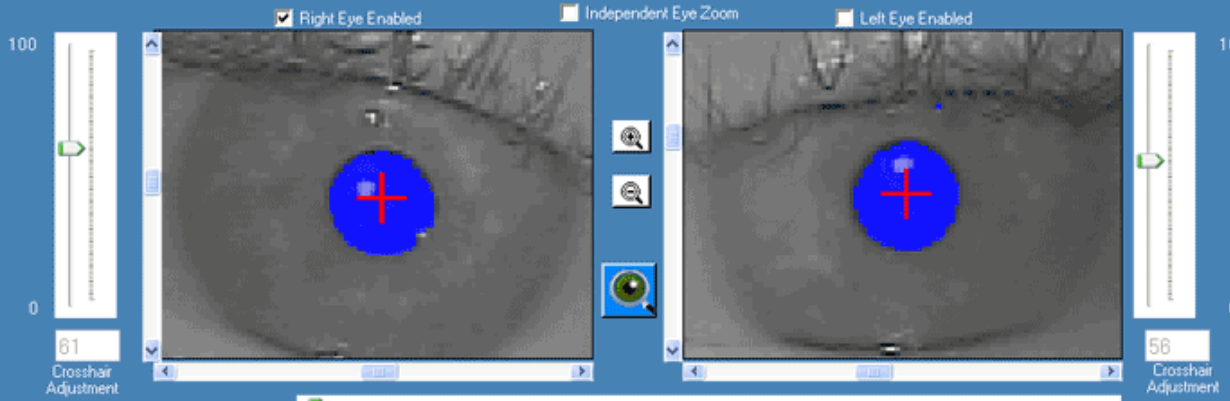


Patient Name:

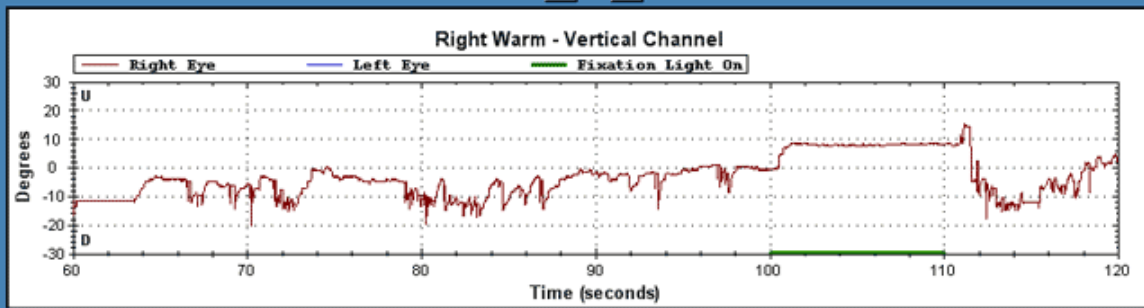
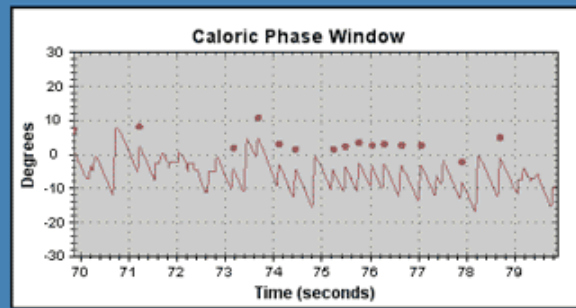
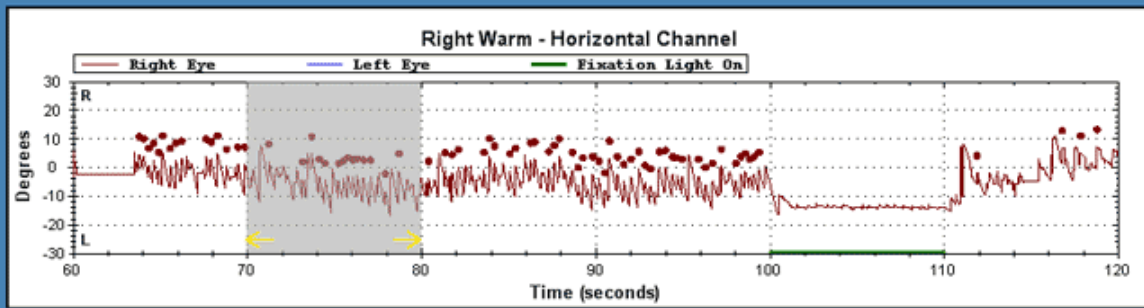
Examination: **AIB TEMPLATE - 2/2/2006**

Current Test: **Right Warm**

- Body Right Positional Headshake
- Body Left Positional Headshake
- Positionals - vision enabled
  - Supine Positional
  - Head Right Positional
  - Head Left Positional
  - Body Right Positional
  - Body Left Positional
- Caloric
  - Spontaneous Pre-Irrigation
  - Right Warm
  - Left Warm
  - Right Cool
  - Left Cool



Reset Culmination Area

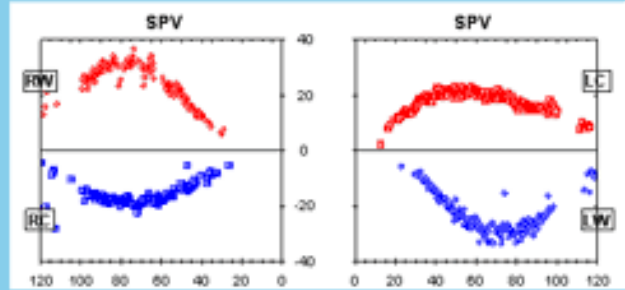
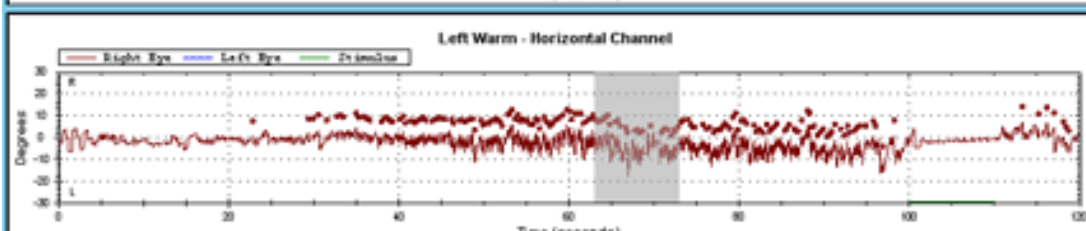
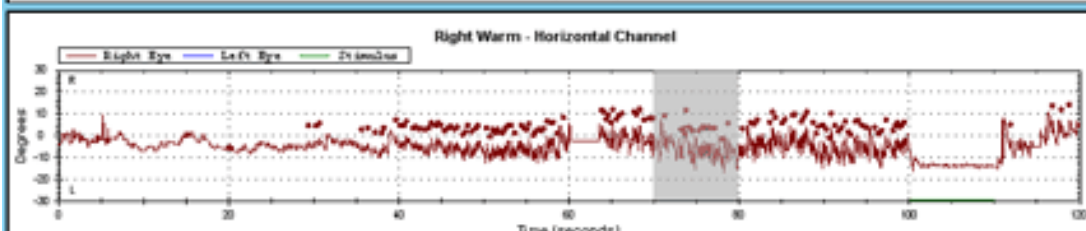
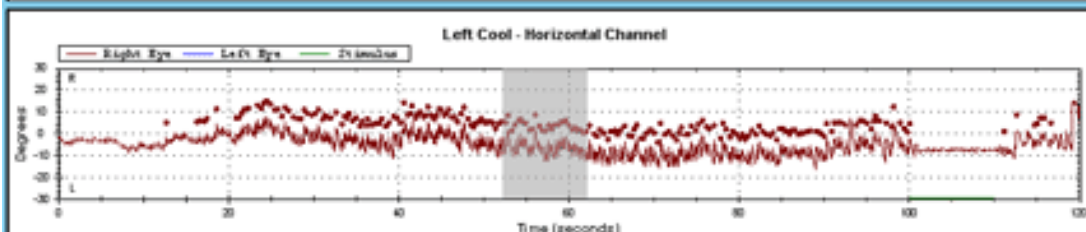
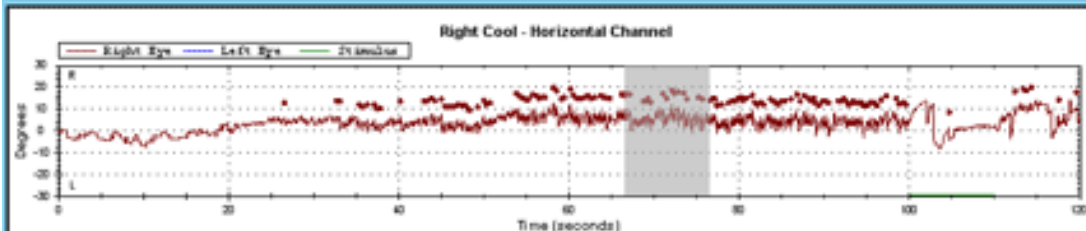
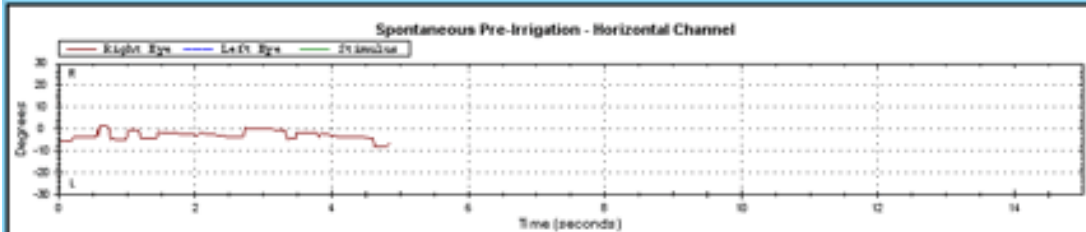


	Horiz. avg. SPV [°/s]	Fixation Index	Unilateral Weakness	
Right Warm	-32.24	0.00	Right Ear	51.26°/s
Left Warm	29.90	0.00	Left Ear	51.32°/s
Right Cool	19.02	0.54	Directional Preponderance	4.62%
Left Cool	-21.42	0.67	Right Beating	53.66°/s
Total	-4.74		Left Beating	48.92°/s

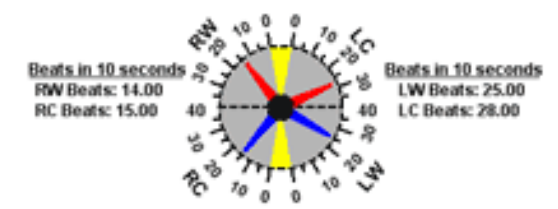
# Caloric Test Summary

Print

Close

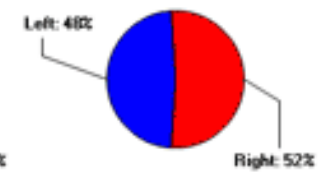
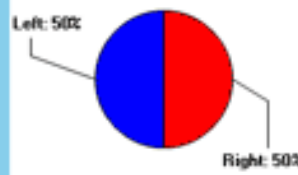


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Unilateral Weakness

Directional Preponderance



# *Dizzy Pearls*

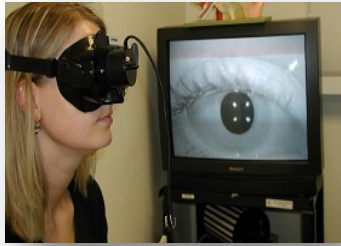
- THERE ARE NO ENT REASONS FOR SYNCOPE!
- IF SYMPTOMS DON'T RESOLVE OR IMPROVE WITHIN A REASONABLE AMOUNT OF TIME (4 weeks), THINK NEOPLASM.
- NYSTAGMUS WITHOUT VERTIGO, THINK CENTRAL LESION.



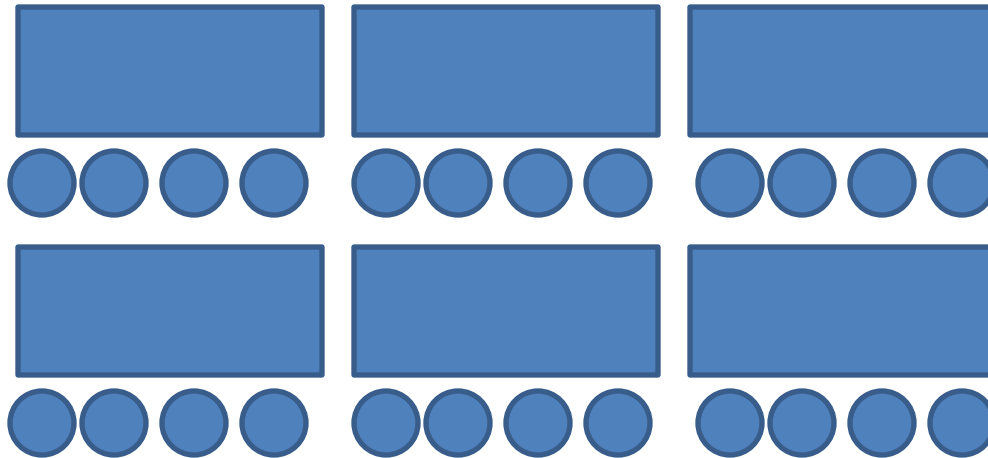
# Vertigo Workshop: Room Set Up

Screen

**Station 3**  
VNG  
Demonstration



Projector  
Speaker



**Station 2**  
Neuro Exam  
Rhomberg  
Fukada  
Stepping Test  
Dix-Hallpike  
Canalith  
repositioning



Station 2

**Station 1**  
Neuro Exam  
Rhomberg  
Fukada  
Stepping Test  
Dix-Hallpike  
Canalith  
repositioning



Station 1



  
Proctors

# Vertigo Workshop Evaluation

Score cards will be used for admission to workshops and attendance.  
Credit will only be awarded for completed score cards.

Name	Session 1 2 3 4 5
On scale of 1 through 5 with 5 being most likely	Scale 1-5
1. Were learning objectives met?	
2. Was instruction free of commercial bias?	
3. Was there adequate instruction before practice?	
4. Was there adequate supervision during practice?	
5. Were training aids useful/realistic in learning skill?	
6. How likely are you to perform these skills in future	
7. Did this training improve your skills?	
Comments:	

# Vertigo Workshop Score Card

Rotate and complete each station.

“Go/No Go” for internal use only.

Completion of workshop is NOT contingent on pass/fail.

Name	Session 1 2 3 4 5				
Task	Go	No Go			
Vertigo physical examination					
•Neurological examination					
•Rhomborg					
•Fukuda Stepping Test					
•Dix-Hallpike					
•Canalith repositioning					
Comments					
Proctor Name	Proctor Signature				