Differential diagnosis of Vertigo

and

Meneier's Disease

Terminologies..

Vertigo: (latin *'verto':* Spinning or whirling movement)

`An illusionary sense that either the environment or one's own body is moving'

- Light headeness:
  - Blackout
  - Fainting attacks
- Instability/imbalance
  - Unstadiness with stumbling/falling while walking
- Oscillopsia
  - Oscillating vision, objects seem to move back/forth,to jerk

Approach..

- ✓ History taking
  - ▶ Whether balance disorder??
  - ▶ If yes: central/peripheral
  - ▶ Etiology
- ✓ Thorough clinical neuro otoligical examination
- ✓ Investigations

History taking..

- Does the pt have vertigo?
- What happened the first time ?

Association	Disease
After head trauma	BPPV
Straining	Semicicular canal dehiscence,perilymphatic fistula,presyncope
Salt load	Meniere's disease
With menstrual periods in women	Migraine
Preceding URTI, mumps,herpes zoster oticus	Vestibular neuritis , labyrinthitis

Duration	Disease
Seconds	BPPV Vascular compression of VIIIth nerve
Minutes to hours	Meniere's disease Migraine associated Acoustic neuroma Otic syphilis Cogan's disease
Days to weeks	Vestibular neuritis
Continuous symptoms	Migraine Psychogenic dizziness Mal de debarquement
Variable duration	Inner ear fistula Labyrinthine concussion Blast trauma Barotrauma Familial vestibulopathy Superior semicircular canal dehiscence syndrome

Precipitating factors	Disease
Head movement	BPPV,vascular loop
Foods–caffeine,cheese,wine Stress /lack of sleep Fluoroscent lights	Migraine
Loud sound, Pressure changes:valsalva,sneezing,coughing	SSC dehiscence Perilymhatic fistula Enlarged vestibular aqueduct
Alcohol,exercise	Episodic ataxias
Immunosupression (advanced age,stress)	Herpes zoster oticus

Associated ear findings	Disease
Hearing loss	Ménière's disease; perilymphatic fistula; acoustic neuroma; cholesteatoma; otosclerosis; transient ischemic attack or stroke involving anterior inferior cerebellar artery,herpes zoster oticus
Tinnitus	Meniere's disease, acute labyrinthitis
Earache	Acute middle ear diseases,herpes zoster oticus
Facial weakness	Acoustic neuroma,herpes zoster oticus
Sweating,dyspnea,palpitations	Panic attacks Cardiogenic cause
Aura,Headache	Migraine
Neurological signs–limbweakness,numbness	Central mass effect,CVA,multiple sclerosis,CP angle tumour

History taking..

Comorbid illness

- Diabetes mellitus
- Thyroid disease
- Cardiac arrythmias

Medications:

- Aminoglycosides ,cisplatin
- Tranquilisers
- Antiepileptics
- Antihypertensives,diuretics
- Alcohol
- Methotrexate
- Anticoagulants

Clinical examination

Eye movements:

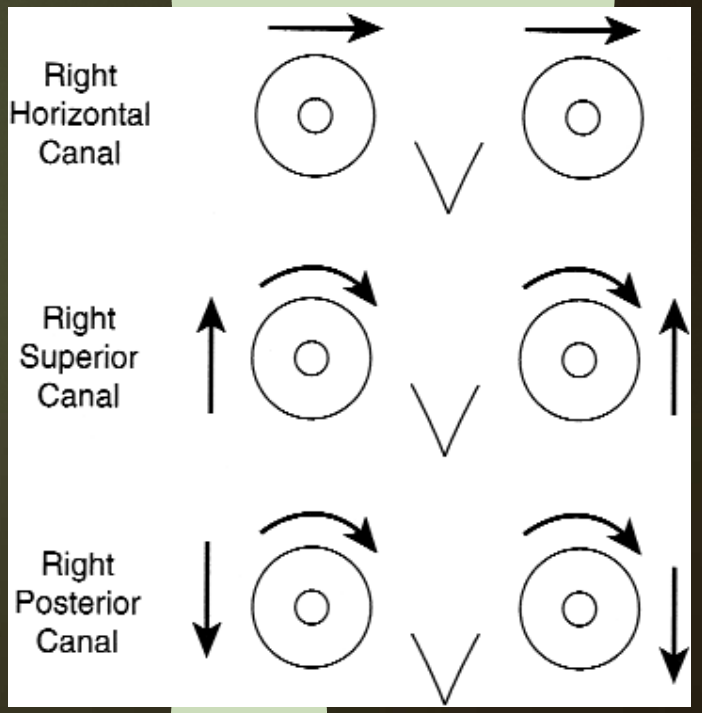
- Spontaneous nystagmus test
  - Unilateral vestibular hypofunction
  - Jerky nystagmus
  - Still head,1 min with eyes closed room darkened and then again for 1 min with eyes open and looking straight ahead;Frenzel glasses
  - Supressed by visual fixation
  - Clinical interpretation:
  - Horizontal torsional nystagmus in acute u/l loss of vestibular function

Positioning testing..

Head movements elicit nystagmus

For posterior semicircular canal BPPV:

- Geotropic torsional nystagmus with the affected ear down
- Delayed onset 2-20secs,transient 45 secs,a/w vertigo,fatigable



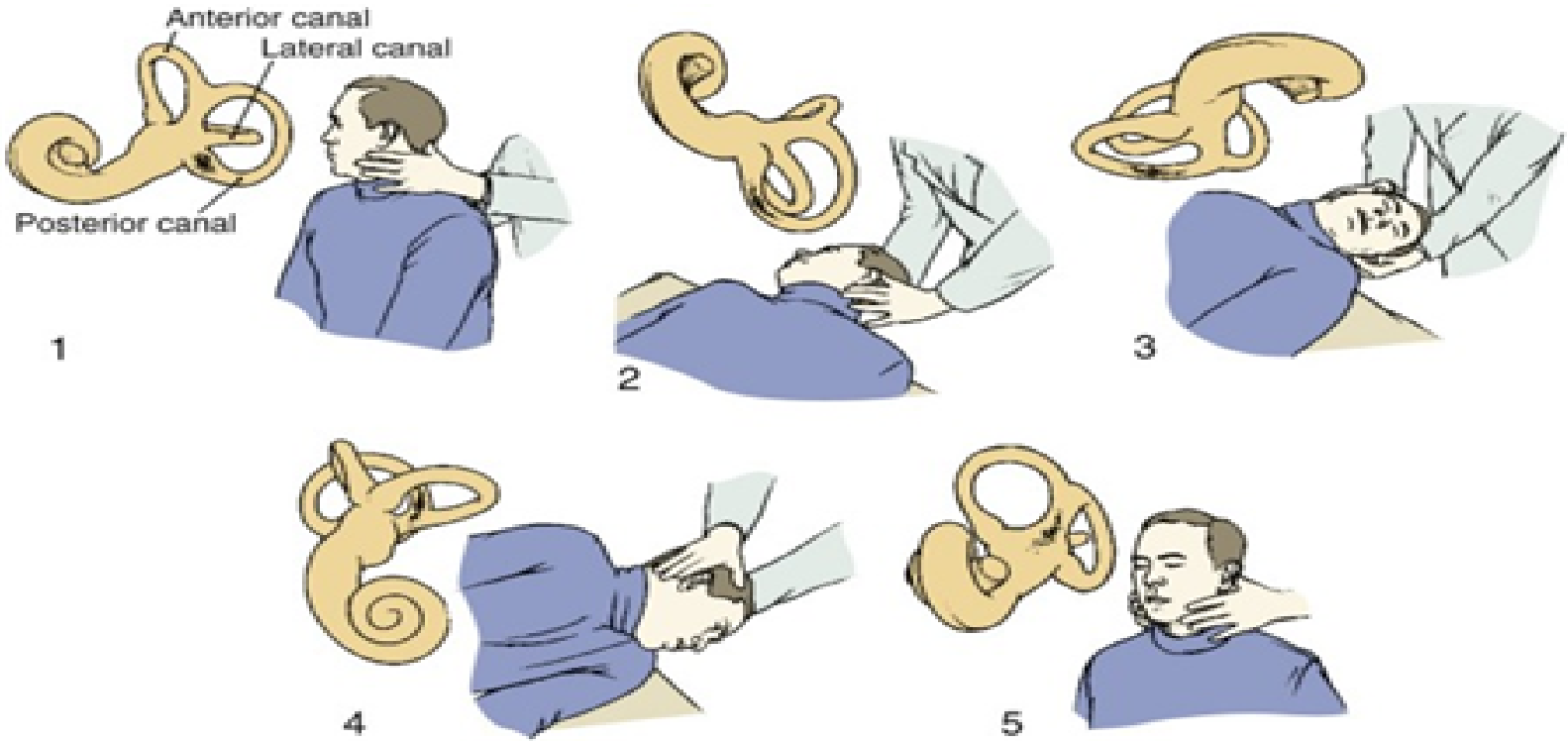
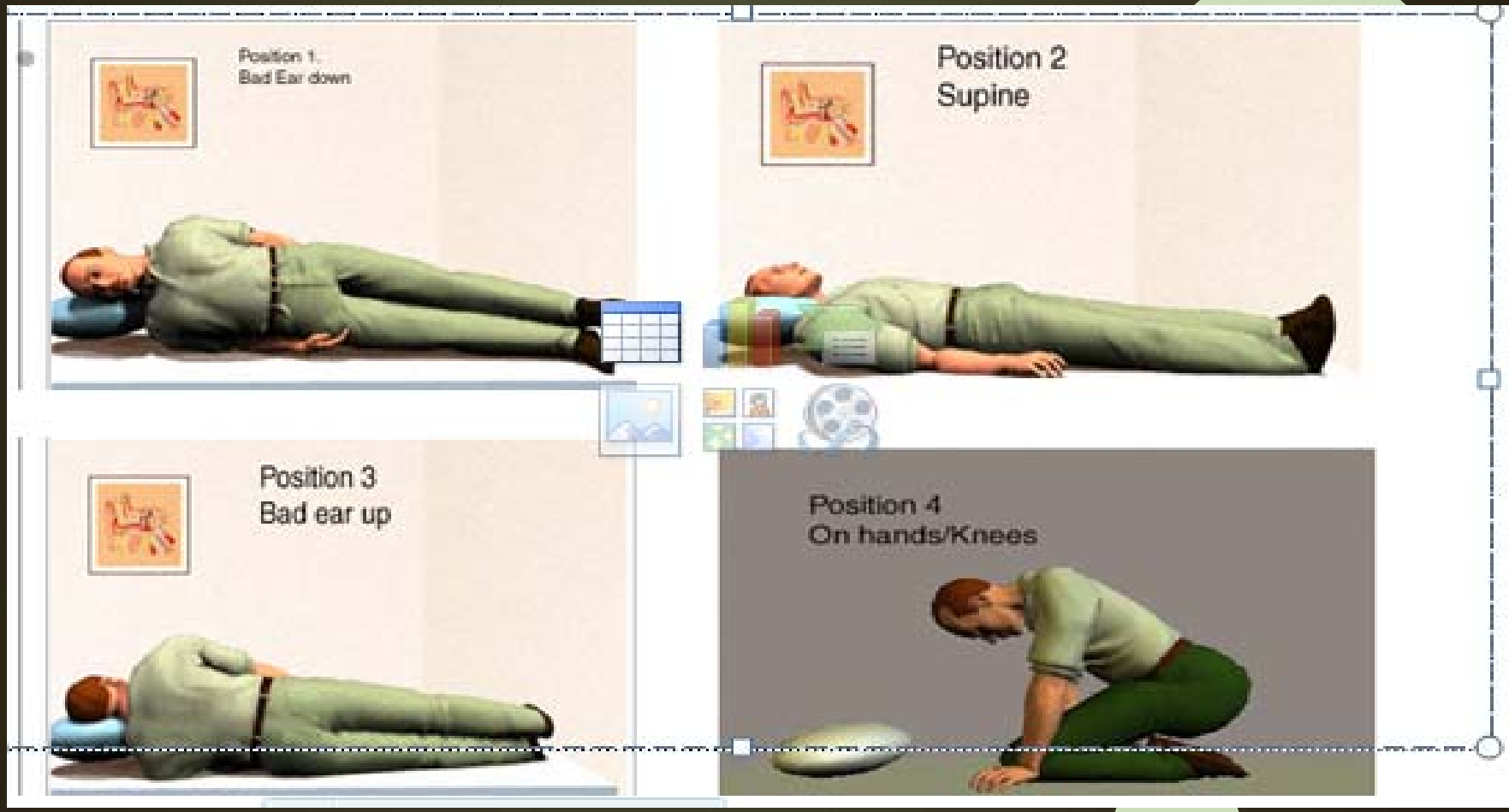


Figure 165-2. Canalith repositioning maneuver for treatment of benign paroxysmal positional vertigo (BPPV) affecting the posterior canal of the right ear. **1,** The patient's head is turned to the right at the beginning of the canalith repositioning maneuver. The *inset* shows the location of the debris near the ampulla of the posterior canal. The diagram of the head in each inset shows the orientation from which the labyrinth is viewed. **2,** The patient is brought into the supine position with the head extended below the level of the gurney. The debris falls toward the common crus as the head is moved backward. **3,** The head is moved approximately 180 degrees to the left while keeping the neck extended with the head below the level of the gurney. Debris enters the common crus as the head is turned toward the contralateral side. **4,** The patient's head is further rotated to the left by rolling onto the left side until the patient is face down. Debris begins to enter the vestibule. **5,** The patient is brought back to the upright position. Debris collects in the vestibule.
(Illustration by David Rini. From Hullar TE, Minor LB: Vestibular physiology and disorders of the labyrinth. In: Glasscock ME, Gulya AJ, eds. Surgery of the Ear. 5th ed. Hamilton, Ontario: B.C. Decker; 2003.)

Log roll over exercises for lateral semicircular canal



Positioning testing

- Lateral semicircular canal BPPV: m.c atypical variant (3-9%)
- Pt lying supine with head inclined 30°forward
- Nystagmus:
  - Geotropic
  - Stronger with the diseased ear undermost
  - Intense vertigo
  - Not delayed onset
  - Not fatigable

Positional testing..

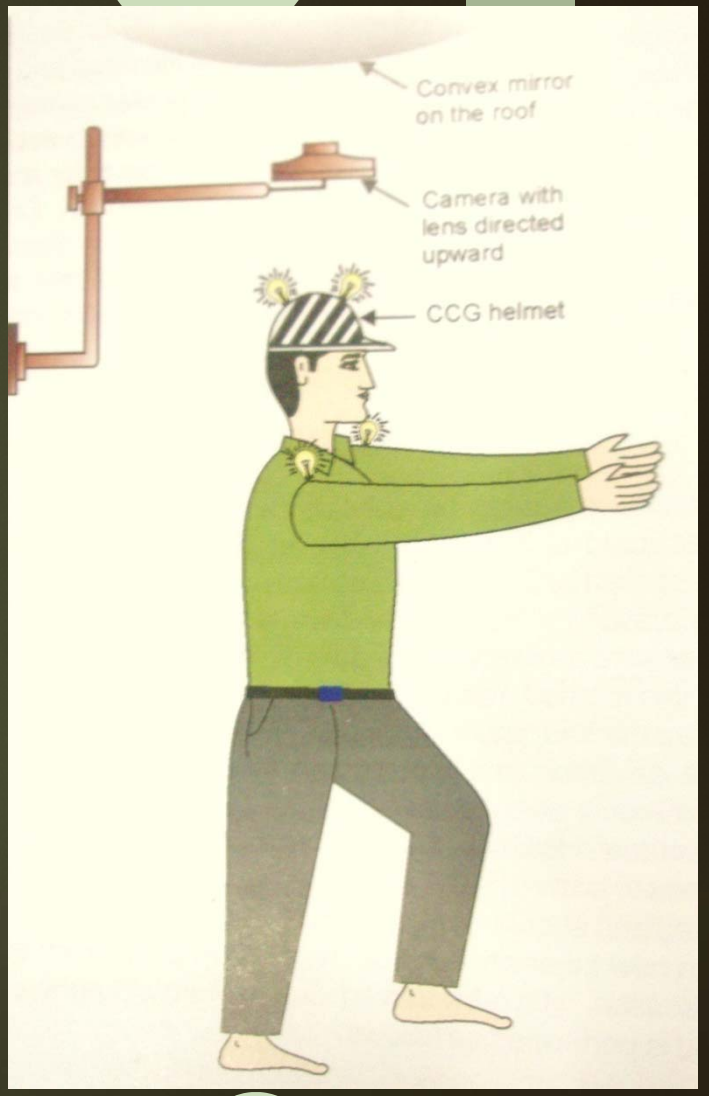
	Benign positional nystagmus	Central positional nystagmus
Latent period	2-10 secs	None
Adaptation	Within 30 secs	Persists
Fatigability	Yes	None
Vertigo	Yes and severe	Absent / very mild
Direction	Towards undermost ear	Variable
Visual fixation	Supression	None

Other bedside tests..

- Changes in the pressure in the inner ear:
  - Valsalva manouvere
  - Pneumatic otoscopy
  - Tragal compression
- Head Impulse test
- Head shake Nystagmus
- Untenberger test
- Rombergs test
- Cerebellar signs

Vestibulospinal functions :

- CRANIOCORPOROGRAPHY:
  - Romberg's test
  - Unterberger /Fukuda stepping test
  - Tandem walking/WOFEC



- Romberg's test:
  - Blindfolded,stand erect for 1 minute
  - Sway >10cm –abnormal

Figure 7–5 Romberg's test.

Figure 7–6 Sharpened Romberg's test.

ukuda stepping test..

Only input –vestibular system

3 parameters:

- Displacement
- deviation
-

step /100 step cycl

s closed and hands ched 90 °

>45° hip flexion

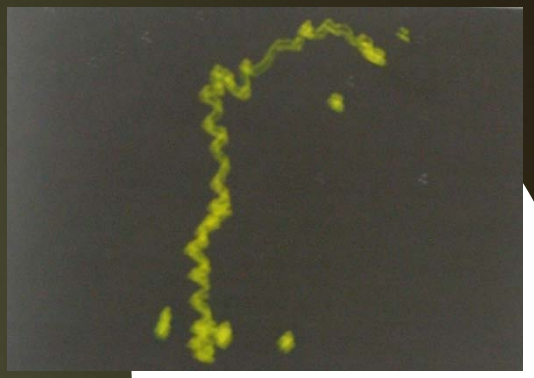
ngle of rotation:

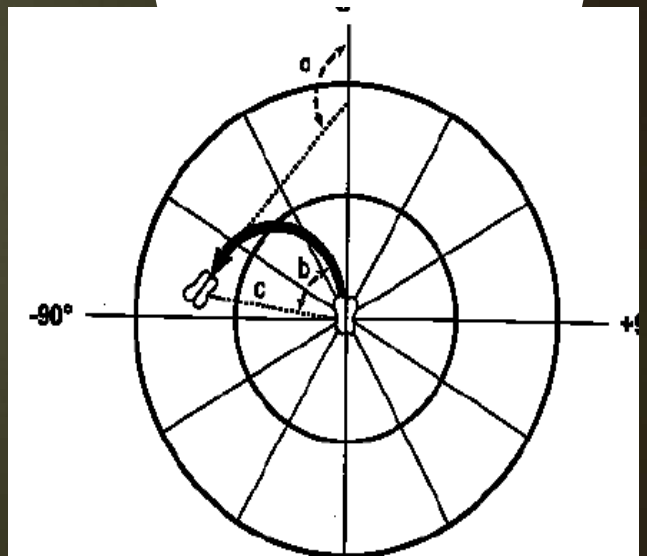
- >30 /45 towards the d side

Distance of displacement:

- 0.5m/ 1 m

Also positive in matic pts





ukuda writing test

- Sit erect not touching chair back , elbow and shoulder extended,non hand on lap
- Only pen touching the paper
- “A B C… top to bottom”
  - Once with eyes open and 3 times blindfolded
- A line drawn from the middle of the 1st letter to the last letter and angle compared to the original
- 6 to 9 ° - imbalance of vestibular dysfunction
- >9 °-diagnosis of vestibular dysfunction

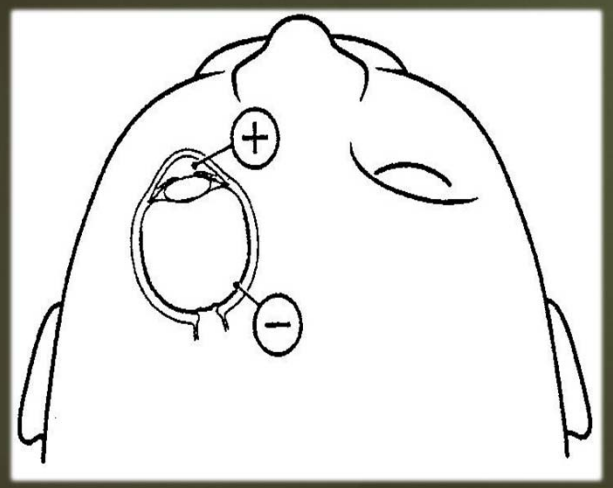
nvestigations

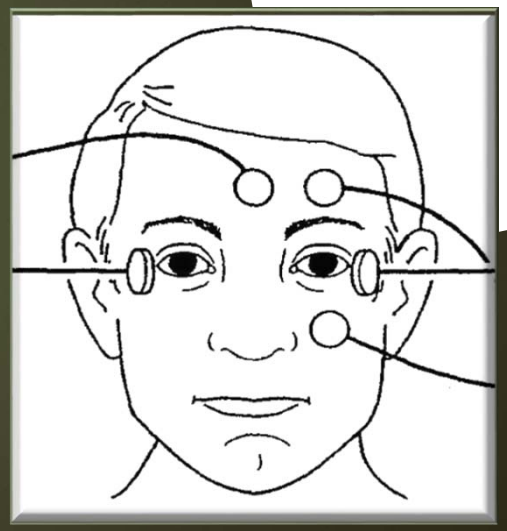
ectronystagmography (ENG)

- basic investigation in the management of all patients su from vertigo and equilibrium disorder
- allows to calculate various Nystagmus parameters ity, amplitude, frequency, duration, to eats, latency etc.
- ocumentary evidence for medico legal purpose, t blication & patient follow up
- only evaluates function of vestibulo-ocular reflex (VOR)
- (vestibulo-spinal & vestibulo-colic reflex -Craniocorpography & computerized Dynamic posturography)

Principle

- Cornea-retinal potential difference.
- Voltage differences can be recorded for eye move
- Electro-occulography to objectively measure ey





sentially ENG consists of 3 parts:

Visual-oculomotor evaluation:

- Three eye movements assessed as part of th
  saccades, smooth pursuit, and optokinetic
- positional testing,
- Gaze st ility, ocular flutter, spontaneous
  latent ny agmus.

estibulo-ocul otor function.

- The bithe al caloric test.

Advantages of Electronystagmography

The results of the test are quantified, and there are well-defined normal limits;

Because ENG provides accurate documentation of
llow up the patient with known vestibul

ocumentation is helpful in medica
orkers' comp nsation cases;

s the only test hat assesses each ear separately an de
lesion localizing information

mitations

- ENG tests only the lateral semicircular canal and provides little information about the status of the posterior or superior semicircular canals, utricle, or saccule.
- Relatively insensitive to torsional nystagmus. How
  li is easily overcome using VNG.

o-Oculography

netic Search Coil Technique

technique determines eye position by locating the pupil and tracking its center; the internal
uter program plots, measures, and analyzes the eye movement similar to traditional ENG.

ally important in evaluating patients with benign paroxysmal positional vertigo (BPPV)

nystamographic Advantage

with no drift

icker than using electrodes

ry

es

ional nystagmus

ystamographic Disadvantage

More expensive, some patients with significant claustrophobia may not tolerate the
sensation of confinement

Patients with ptosis, puffy eyes, obscuring eyelashes, or other eye abnormalities may be difficult

Patient in a cage controlling a magnetic field

The patient wears a soft contact lens in which a wire coil is embedded

Eye movement effects a change in the magnetic field, which is recorded

- Very high [illegible] data for all types of eye movements, including torsional nys

advantages

- Slight discomfort to the patient (owing to the lens)
- Very high cost of the equipment

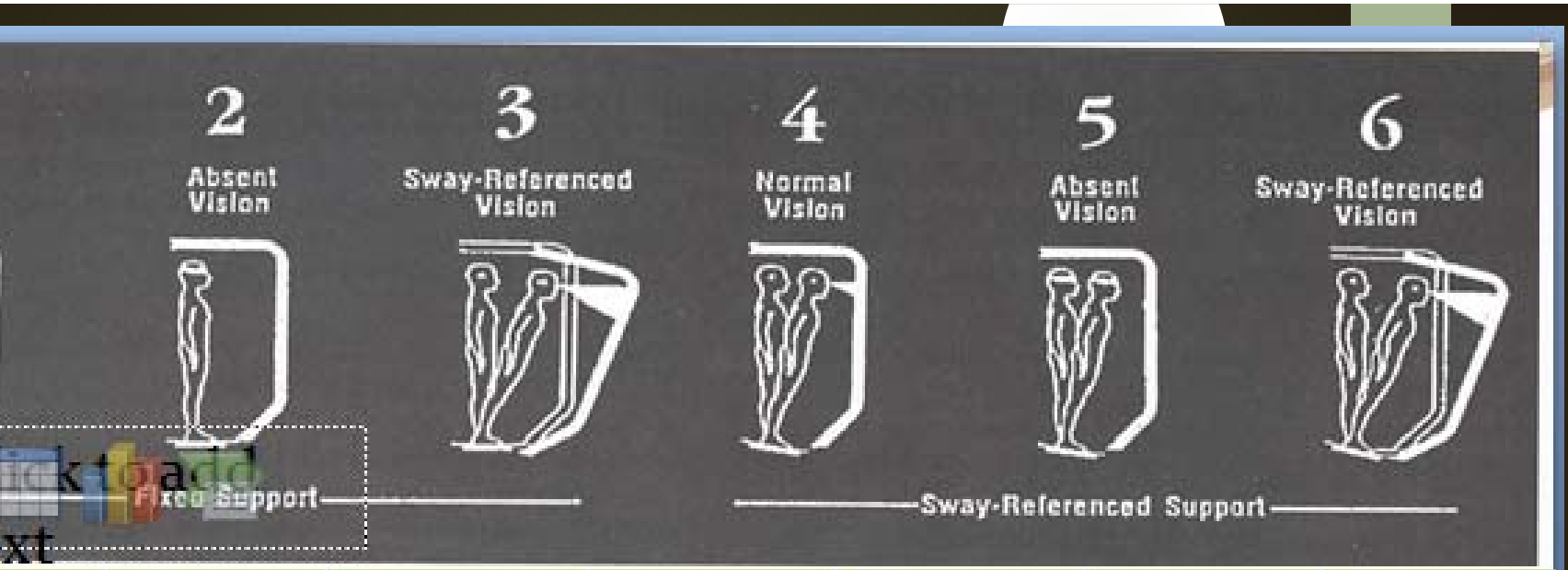
This procedure has yet to gain widespread acceptance and is **rarely used**

he rotational tests..

- Test of vestibulo-ocular reflex
- Carried out by BARANY
- Passive and active
- ir tests
- rotational

omputerized dynamic posturography

- Developed by Nashner and Black
- Potential mechanism for all sensory system evaluation
- Planning and monitoring course of vestibular rehabilit
- alingering,conversion disorder

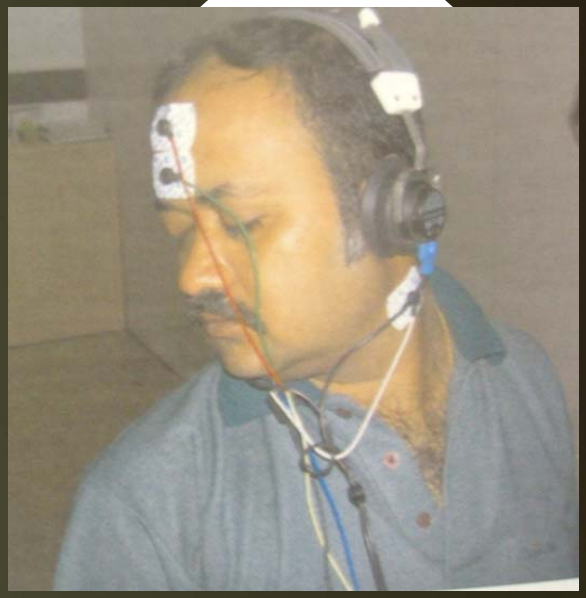


	1	2	3	4	5	6
t	fixed	fixed	fixed	swayed	swayed	swayed
	open,	closed	open,	open,	closed	open,
	fixed	fixed	sway-referenced	fixed	fixed	sway-referenced

2	3	4	5	6	Interpretation
N	N	N	Ab	Ab	vestibular dysfunction
N	Ab	N	N	Ab	visual preference
Ab	Ab	N	Ab	Ab	somatosensory and vestibular dysfunction

VEMP test

- Testing the vestibulo-collic reflex
- Pure tone sounds of 500 Hz at 95-105dB
- 3-5 stimuli/second
- ...ally contracted



Absent VEMP

- Failure of activation of SCM
- Saccular disorder
- Menier's disease

Lower threshold in VEMP with CHL-SSC dehiscence

Meniere's disease

Prosper Meniere -1861 first described the symptom cpmplex

Before 1938, it was used as a generic term for peripheral vertigo

Whites

[illegible]

[illegible]th-5th decade

[illegible]L-50% within 5 yrs-if second ear involved ra[illegible]

Familial occurrence-10%-20% cases-a/w migraine

Autosomal dominant

a/w specific MHC's- HLA B8/DR3 Cw7—autoimmune

Etiology

thogenesis..

- Hallmark :endolymphatic hydrops
- Overaccumulation of endolymph at the expense of p ic space
- Inadequate absorption of endolymph by endolym eory
- PE : perisaccular fibrosis and decreased duct size
- Imaging:shorter endolymphatic drainage systems-distance between the posterior SSC and posterior fossa

thophysiology..

Rupture of membranous labyrinth

Leakage of K+ rich endolymph in perilymph

High concentration of extracellular K+

erve cells

Inactivation

e in auditory and vestibu neuronal outflow-s/s

ing of the membranes-resto on of chemical mileu-resolution of s/s

ated exposure — Chron etoriation in inner ear function

tiology..

ultifactorial,

common endpoint of variety of injuries/anatomic vari

cause: Meniere's disease

olymphatic hydrops

- Viral infection-mumps,measles-delayed endolymphatic
- Ischemia of the endolyphatic sac/inner ear
- Autoimmune-association with HlA-Ab to HSP70
- a/w development of hydrops-acute otitis media,labyrinthitis,congenital inner ear

linical presentation..

Typical triad

- Recurring attacks of vertigo(96.2%)
- Tinnitus (91.1%)
- [illegible]g loss(87.7%)

ochlear Menier[illegible]s disease

Vestibular Menie[illegible]e's disease

Recurrent vestib[illegible]opathy and atypical Meniere's disease

Clinical course-highly variable

Cluster of attacks separated by long remissions

Vertigo Ceases spontaneously in 57%-2 yrs,71%-8.3

Tumarkin crisis / drop attacks: "feeling of being pushed"/

- unexplained falls without LOC/associ
- Acute utriculosaccular dysfunction
- 2-6%
- Clusters and then remits

Lermoyez:

- Tinnitus and hearing loss precede and worsen with the onset of vertigo

Table 165-1 -- AAO-HNS Criteria for Meniere's Disease Diagnosis

Major Symptoms
Vertigo
• Recurrent, well-defined episodes of spinning or rotation • Duration from 20 minutes to 24 hours. • Nystagmus associated with attacks • Nausea and vomiting during vertigo spells common • No neurologic symptoms with vertigo
Deafness
• Hearing deficits fluctuate • Sensorineural hearing loss • Hearing loss progressive, usually unilateral
Tinnitus
• Variable, often low-pitched and louder during attacks • Usually unilateral • Subjective
Diagnosis
Possible Meniere's disease
• Episodic vertigo without hearing loss *or* • Sensorineural hearing loss, fluctuating or fixed, with dysequilibrium, but without definite episodes • Other causes excluded
Probable Meniere's disease
• One definitive episode of vertigo • Hearing loss documented by audiogram at least once • Tinnitus or sense of aural fullness in the presumed affected ear • Other causes excluded
Definite Meniere's disease
• Two or more definitive spontaneous episodes of vertigo lasting at least 20 minutes • Audiometrically documented hearing loss on at least one occasion • Tinnitus or sense of aural fullness in the presumed affected ear • Other causes excluded
Certain Meniere's disease
• Definite Meniere's disease, *plus* histopathologic confirmation

From Committee on Hearing and Equilibrium guidelines for the diagnosis and evaluation of therapy in Menie
disease. American Academy of Otolaryngology–Head and Neck Foundation, Inc. Otolaryngol Head Neck Su

nvestigations..

ENG

- Reduction in caloric response-48%-73.5%
- Complete absence-6-11%

Head thrust test

- Asymmetry is subtle-29%pts

Electrocochleography

- SP/AP ratio increases
- 62% pts have elevated ratios

Dehydrating agents

- Urea,glycerol,furosemide
- [illegible] more improvement in at least 2 frequen
- 12% impr[illegible]vement in speech discrimination scor

VEMP

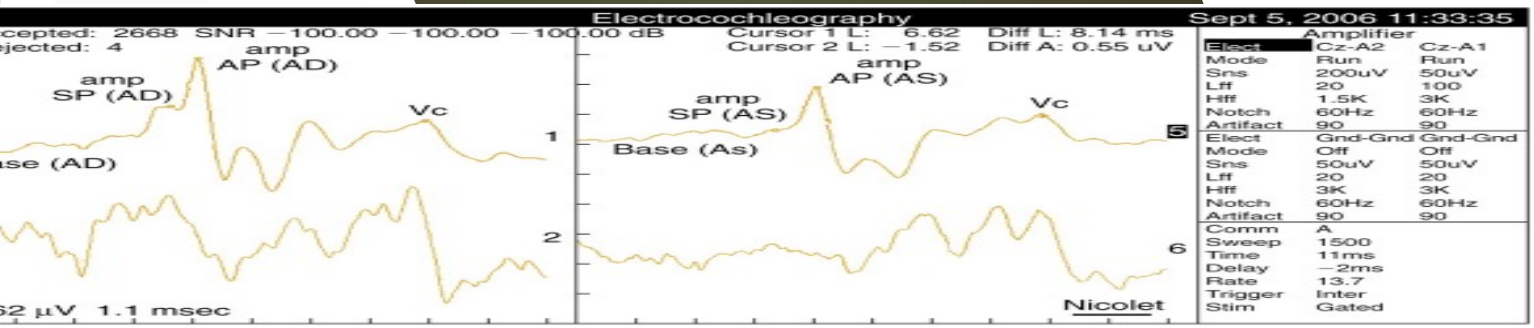
- Elevated VEMP threshold with flattened tuning

lectrocochleography

Recording of 3 parameters:

- Cochlear microphonics
- Summating potential-complex
- [illegible]ial– auditory nerve

Meniere's relate[illegible]crease of SP attributed to the basilar membrane



Electrocochleography

Base (AD)	−1.52ms			Base (AS)	−1.52ms		
SP (AD)	1.96ms			SP (AS)	1.70ms		
amp	1.01uV	SP/AP (AD)	0.50 A	amp	0.24uV	SP/AP (As)	0.22 A
AP (AD)	2.49ms	Vc-AP-AD	4.22ms	AP (AS)	2.44ms	Vc-AP (As)	4.18ms
amp	2.00uV			amp	1.12uV		
Vc	6.71ms			Vc	6.62ms		

Differential diagnosis of episodic vertigo

Disease	History and examination	Investigations
1 Auto Immune Inner Ear disease AIED	B/L rapidly progressive SNHL,(monthly intervals), Recurrent vertigo , Ocular inflammation, Depigmentation (VKH), URTI,LRTI(WG), Recurrent thrombosis,spontaneous abortions(APLA)	CBC,DLC,ESR,RF,ANA, Anti dsDNA,APLA Ab,C3,C4,Western Blot Assay for anti HSP-70, RESPONSIVENESS TO CORTICOSTEROIDS
2.Perilymphatic fistula	Dysequilibrium with nose blowing/lifting heavy wt, Atecedent H/o trauma,ear surgery, HENNBERT'S SIGN TULLIO'S PHENOMENON	Intra-op--- Fluid, B2 transferrin, HRCT

Disease	History and clinical features	Investigations
3.Migraine	Recurrent characteristic headache-throbbing,pulsatile,unilateral, nausea,vomiting,photophobia,phonophobia,aura,parasthesias	
4.Otosyphilis	Late otosyphilis-HUTCHINSON's TRIAD-EXCLUSIVE FEATURE, Hennbert's and tullio's phenomenon	VDRL,FTA-AB,MHA-TP
5.Labyrinthine concussion	H/O trauma Vegetative symptoms-nausea,vomiting Vertigo-subsides over days to weeks	PTA-NIHL with 4 KHZ loss MR=imaging
6.EVAS	Hearing loss since childhood, Progresses with minor head trauma, Vertigo-late onset-adulthood	CT->1.5mm at midpoint

Treatment options..

Aim

- Stop vertigo, abolish tinnitus and reverse hearing loss
- Spontaneous improvement in 60%-80%cases
- Placebo effect

3 broad options

- Dietary
- Medications
- Surgery

Dietary modifications..

- Salt restriction
- Diuretics
  - Neither has its efficacy confirmed by double-blind placebo controlled studies*
- Carbonic anhydrase inhibitors-Acetazolamide
  - Not more effective than diuretics

*

Medications ..

- Vasodilators : strial ischemia
  - Betahistine
- Symptomatic treatment:
  - Antihistaminics
  - Anti-emetics
  - Sedatives
  - Anti-depressants
  - Psychiatric treatment

Local overpressure therapy

Rationale use

Energy of the pressure pulses displaces the perilymphatic fluid stimulates the flow of endolymphatic fluid --- results in a reduction of endolymphatic fluid

- Meniett device: FDA approval since 2000
  - Complex pulses 20 cm water over 5 min period
  - 3 times daily
  - Ventilation tube placed thru tympanic membrane

Significant decrease in vertigo for the first 3 mths,later similar to placebo

Intratympanic Injection

- Gentamicin
  - Through tympanostomy tube/through tympanic membrane
  - Vestibulotoxicity high relative to cochleotoxicity
  - 90% complete control of vertigo,3% SNHL*
  - Current regime:

    Low-dose (16 mg/mL) gentamicin buffered with HCO_3 -- injected intratympanically by a 22-gauge fine needle-- through posteroinferior quadrant of tympanic membrane— total amount 1ml

    Lie in supine position with the effected ear up for 30 minutes

    Ecouraged not to swallow

Intratympanic injection..

- Dexamethasone :
  - Addresses the autoimmune component
  - Intractable vertigo
  - Functional hearing left
  - Concentrations ranging from 2-24 mg/ml
  - Repeat every 3 mths
  - Complete resolution in 82% v/s 57%receiving saline*

Surgical treatment..

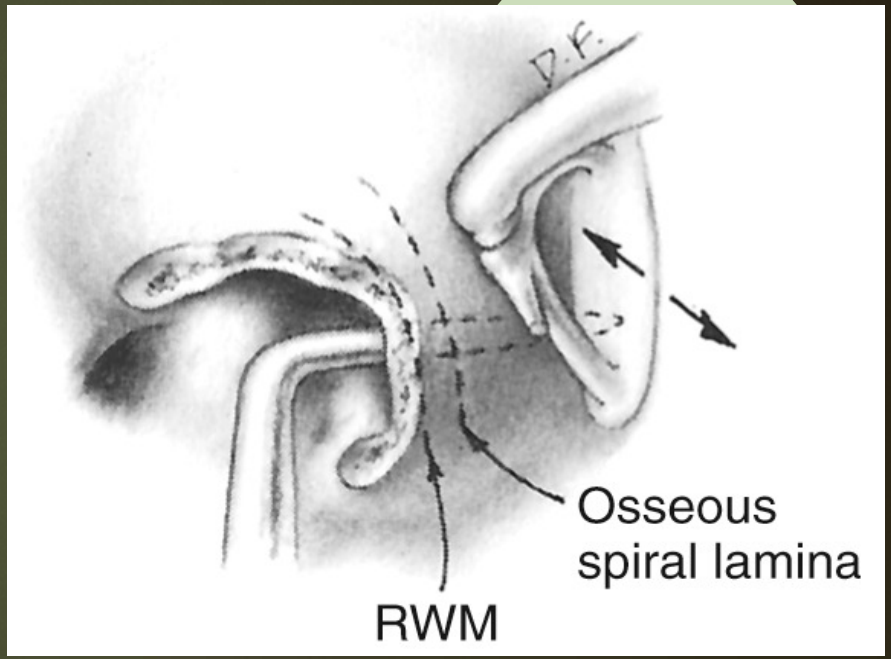
Indications

- "Intractable vertigo in whom medical therapy has failed"

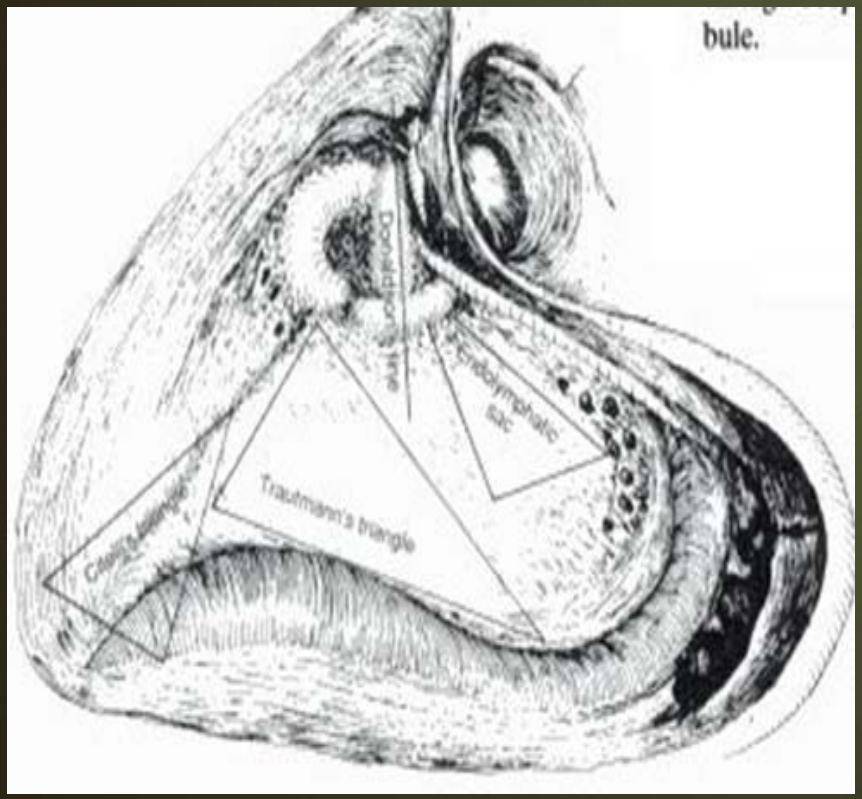
- Cocleosacculotomy
- Endolymphatic sac surgery
- Ablative surgery

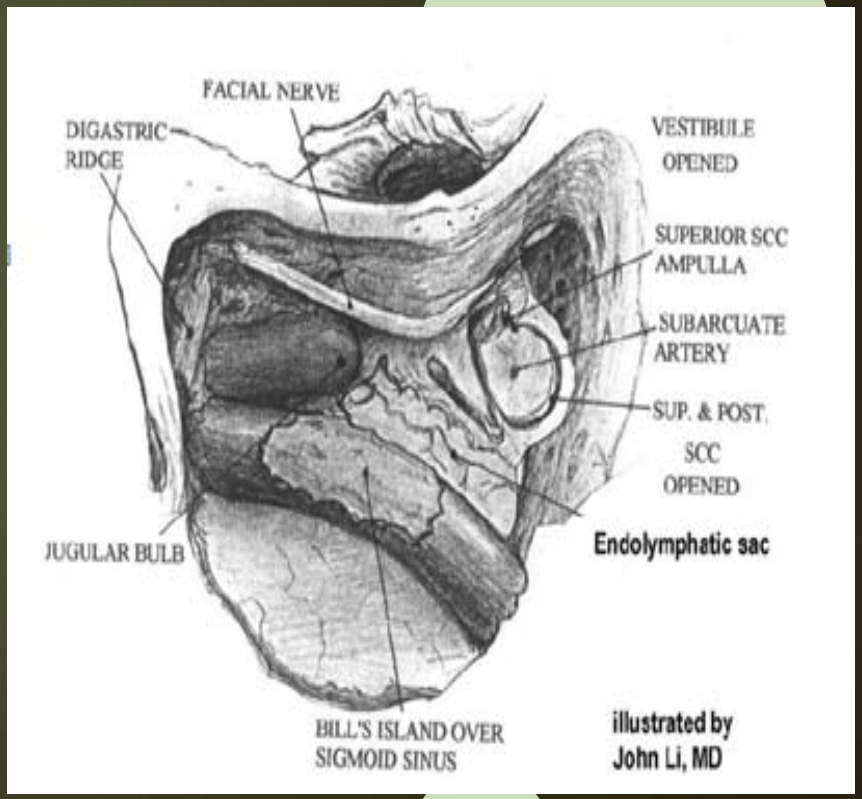
Cochleosacculotomy

- Create a permanent communication to equilibriate endolymphatic and perilymphatic pressures
- Alternative to labyrinthectomy in elderly patients with preexisting hearing loss



Endolymphatic sac surgery



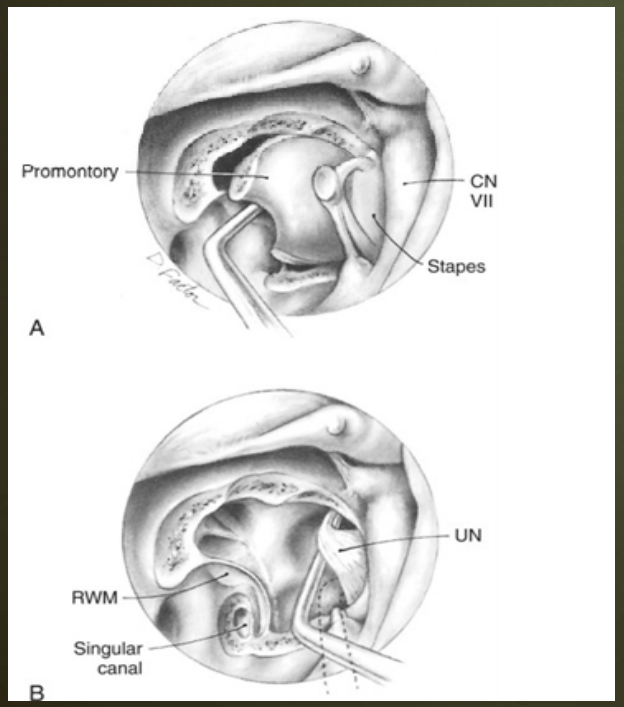


Ablative vestibular surgery

Labyrinthectomy

Recurrent/persisting vertigo with severe to profound SNHL

1. Transcanal
2. Transmastoid –gold standard



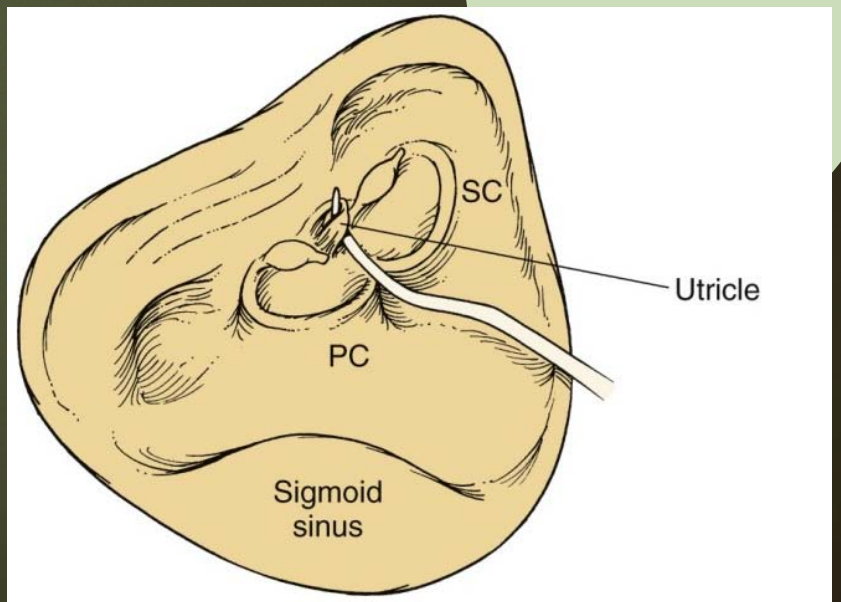


Figure 167-7. Transmastoid labyrinthectomy (left ear). Exposure of the ampullated ends of all three semicircular canals and the vestibule is accomplished, and all neuroepithelium is removed under direct vision. Care is taken to skeletonize but not expose the facial nerve. PC, posterior semicircular canal; SC, superior semicircular canal.

Vestibular nerve section:

Selective vestibular nerve section

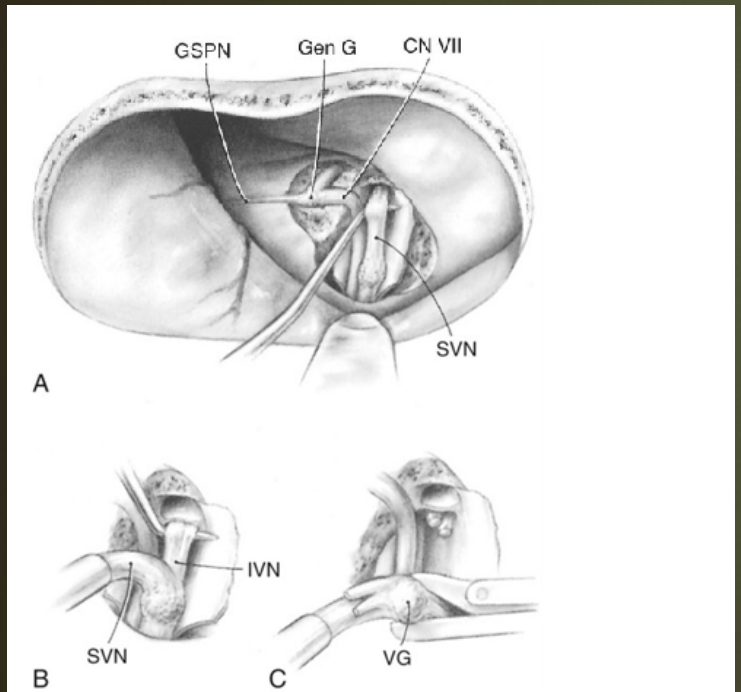


Figure 167-10. Selective transection of vestibular nerve (middle fossa approach). **A,** Vestibular and facial nerves are exposed in the superior compartment of the internal auditory canal. The superior division of the vestibular nerve (SVN) is avulsed distally with a right-angle hook. Gen G, geniculate ganglion; GSPN, greater superficial petrosal nerve. **B,** Traction on the distal end of the SVN with a suction tip permits exposure of the inferior division of the vestibular nerve (IVN). **C,** After lateral transection of the IVN, the vestibular nerve trunk is transected proximal to the vestibular ganglion (VG).

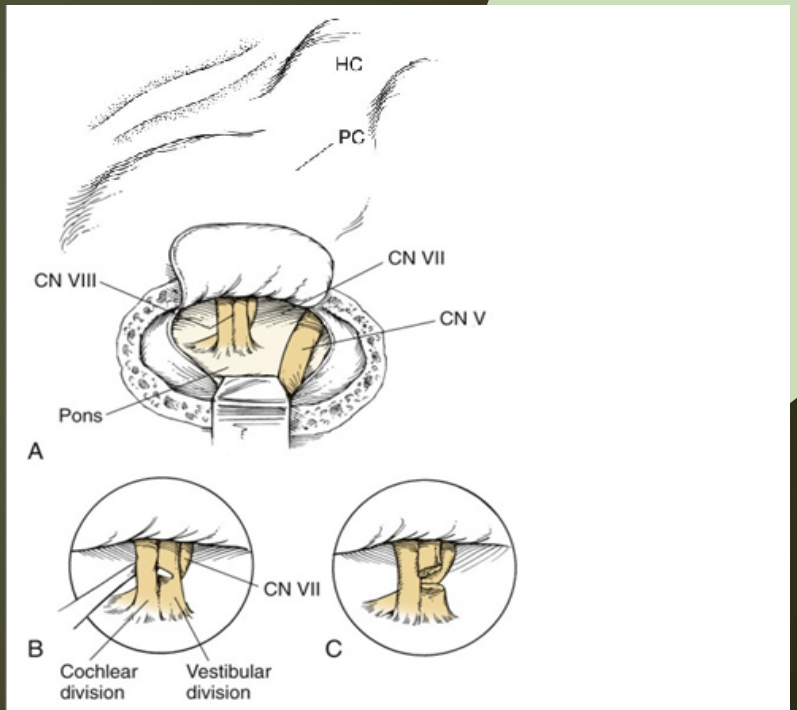


Figure 167-11. Retrolabyrinthine vestibular nerve transection. **A,** After a flap of posterior fossa dura including endolymphatic sac has been elevated, the retractor exposes the seventh and eighth cranial nerves (CN VII, CN VIII). **B,** Vestibular nerve fibers are separated from the cochlear nerve with sharp and blunt instruments. **C,** The vestibular nerve is transected. CN V, trigeminal nerve; HC, horizontal semicircular canal; PC, posterior semicircular canal.

Take home message

- Identify vertigo!!!
- History taking
- Clinical neurootological examination
- Diagnostic investigations–last resort


Thank
you……..