Peripheral Vestibular Disorders
History

- Spinning?
- Duration
- Frequency
- Effect of head movements
- Specific position that induced
- Ataxia
- Aural symptoms
- Ear disease
- Neurological Hx: LOC, Epilepsy, Migraine
- PMHx, PSHx, DHx, FHx…….
I. Vertigo lasting minutes to hours
   A. Ideopathic endolymphatic hydrops (Ménière’s disease)
   B. Secondary endolymphatic hydrops
      1. Otic syphilis
      2. Delayed endolymphatic hydrops
      3. Cogan’s disease
      4. Recurrent vestibulopathy

II. Vertigo lasting seconds
    BPPV

III. Vertigo lasting days
    Ves’ neuritis

IV. Vertigo of variable duration
    A. Inner ear fistula
    B. Familial vestibulopathy
    C. >1 Disease

V. Bilateral vestibular deficit
VERTIGO LASTING MINUTES TO HOURS

- Ménière’s disease
- Otologic syphilis
- Delayed endolymphatic hydrops
- Cogan’s syndrome
- Recurrent vestibulopathy
**Otologic syphilis**

- 6.5% of unexplained SNHL
- 7% of patients said to have Ménière's disease.
- Tullio phenomenon?
- Hennebert's sign?
- VDRL FTA-abs
- Penicillin +/- steroids
  - Cure vestibular
  - Hearing+discrimination improvement
Otologic syphilis

Two otologic categories acquired or congenital

Early syphilis
- S/S within 2 years of exposure
- Vestibular symptoms are less frequent
- vary from mild to vegetative imbalance
- HL: rapid, bilateral, and frequently profound

Late syphilis
- >2Y (Up to 50Y)
- indistinguishable from Ménière's disease
- 90% Interstitial keratitis I.K.
- Hutchinson's triad (*late congenital*)
  - SNHL, I.K. and notched incisors
**Delayed endolymphatic hydrops**

- 1975 Nadol* first described
- Previous, profound Deafness → (1–74 years) Ménière's like disease
- Ipsilateral and contralateral
- Excellent results with Labyrinthectomy
- TB studies demonstrate endolymphatic hydrops
- Lasix test:
  - Dehydrating agents, improve the vestibular S/S
- Rx only hearing ear = medical Rx of Ménière's

Recurrent vestibulopathy RC

LeLiever and Barber *
Recurring (variable intervals)
Sudden
Ménières-like vertigo
lasting minutes to hours (typically < 24 h)
NO audiologic symptoms
NO Focal neurologic S/S

Laryngoscope 41:1–6, 1981
Recurrent vestibulopathy RC

"vestibular" Ménière's
Unknown (?viral)
Sex distribution is equal
Common: 10% Dizziness
22% reduction in caloric responses
70% spontaneous resolution in 10 y
30% diagnosis was changed
(14% Ménière's)
55 years had cold → vertigo
ENG reducing caloric responses in the left ear

Vestibular neuritis developed in this man at ages 55 years, reducing caloric responses in the left ear. **A**, Right semicircular canal; the nerve and crista are normal. **B**, Left semicircular canal; atrophy of the nerve and partial atrophy of the crista.

VERTIGO LASTING DAYS TO WEEKS

Vestibular neuritis*
Vestibular neuritis

- Isolated vertigo
- NO audiologic symptoms
- NO Focal neurologic S/S
- unilateral peripheral vestibular dysfunction
- mainly in the superior vestibular nerve region
- been called
  - epidemic vertigo
  - acute labyrinthitis
  - vestibular paralysis
  - vestibular neuropathy
  - vestibular ganglionitis

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Vestibular neuritis

- Abrupt onset
- Single, severe and prolonged vertigo
- Occasionally flurry of attacks over several weeks
- Nystagmus
  - Spontaneous
  - Vigorous
  - Toward the uninvolved side,
  - Horizontal or horizontal-rotary
- Caloric responses are diminished or absent in the involved ear
Vestibular neuritis

- 50% Infectious illness precede VN
- Spontaneous recovery occurs over weeks to months
- Symptomatic Treatment
Vestibular neuritis

- HSV-1 DNA has been identified in vestibular ganglia + Animal study
- VZV
- Epstein-Barr viral
- *Borrelia burgdorferi*
Temporal Bone Pathology

- Partial to total loss of the superior VN
- Degeneration of the hair cells occurs in the corresponding sensory organ
VERTIGO OF VARIABLE DURATION

- Inner ear fistula
- Inner ear trauma
  - 1. Nonpenetrating trauma
  - 2. Penetrating trauma
  - 3. Barotrauma
- Familial vestibulopathy
VERTIGO LASTING SECONDS

Benign paroxysmal positional vertigo
Benign Paroxysmal Positional Vertigo

- the most common peripheral vestibular disorder
- semicircular canal becomes sensitive to gravity
- first described in 1921 by Bárány
- 1952, Dix and Hallpike
  - reported this entity in a large group of patients.
  - described the Dix-Hallpike maneuver
  - recognized features of the nystagmus
    - Latency
    - directional characteristics
      - brief duration
      - Reversibility
      - fatigability
  - incorrectly concluded that BPPV results from an otolithic disturbance.
BPPV

Schuknecht
- loose otoconia from the utricle
- Ampullopetal PSCC → inhibitory
- *Cupulolithiasis* otoconia on the cupula

Harbert
- ampullofugal PSCC → excitatory

McClure
- Canalithiasis mechanism
Incidence

- 30% of peripheral vestibular disease
- 15% per 100,000 in Japan
- 64 per 100,000 in Minnesota.
- Twice Ménière's
- Mean age fifth decades
- Increases with age.
- Women: men 1.6:1
Etiology

- Unknown
- Trauma head injury Surgery
- Prolonged bed rest.
- Infections
- 15% vestibular neuronitis.
- Ménière's disease
- Recurrent vestibulopathy
- Migraine ?ischemia
**BPPV: Pathophysiology**

Degenerative debris from utricle (otoconia)

*Canalithiasis Theory*
Floating freely in the endolymph

*Cupulolithiasis Theory*
Adhering to the cupula
**PSCC**

Hangs down like the water trap in a drain pipe

Allowing the crystals to settle in the bottom of the canal.
Diagnosis
History

- Sudden
- Seconds
- Severe vertigo

Associated with change in head position.
  - Rolling over or getting into bed
  - Assuming a supine position.
  - ARISING FROM A BENDING POSITION
  - Looking up to take an object off a shelf
  - Tilting the head back to shave
  - Turning rapidly.

Bouts of vertigo → Remissions

Chronic balance problems

Worse in the morning
Examination

Dix-Hallpike Maneuver

Sidelying test
  – Unable to move
  – Only for PSCC
Dix-Hallpike Maneuver

Hagr 6 D

- Delay seconds latency
- Downward ear beating superior poles of the eyes (Geotropic) - Up for the head down for the gravity
- Duration <1 minute
- Directional change
- Dizziness (Subjective)
- Disappear fatigable
Fig. 1. The Dix-Hallpike test for right-sided benign paroxysmal positional vertigo

**Step A.** Stand at the patient’s right side and rotate the patient’s head 45° to the right to align the right posterior semicircular canal with the sagittal plane of the body. The patient’s eyes should remain open.

**Step B.** Move the patient from the seated to the supine position with the right ear downward, and extend the patient’s neck until the chin is pointing slightly upward. Note the latency, duration, and direction of nystagmus if it occurs, and the latency and duration of vertigo. (To test for left-sided BPPV, change sides from right to left.)
Horizontal canal BPPV

- 17% of cases
- Supine head lateral provocative
- Latency no more than 3 sec
- 30 sec to 1 min duration
- may beat toward or away from side of the cupula
- No fatigability
- increases in magnitude while maintaining the test position
- Cupulolithiasis > canalithiasis
- From reposition of PSCC for BPPV
- 92% Side lying with the affected ear up for 12 h
Superior canal BPPV

- Dix-Hallpike positioning testing
- Rt PSCC = Lt SSCC vice versa
- Least common
Test Results

ENG+2-dimensional & videonystagmography limitation

RC

Do not record the torsion

Low frequency (0.003 Hz) \( \ast \) = PTA @125Hz

Lateral SCC

LOC
D/D

- Postural hypotension
  - anti-hypertensive drugs
  - CV problems
- Fistula
- Drugs
- Cupula sensitive to gravity RC
  - PAN-1
  - PAN-2
  - Heavy water
History is virtually pathognomonic
Only type of vertigo
- Multiple times per day
- Brief episodes
- No auditory complaints
- No neurological
Epley Maneuver

- Dr. John M. Epley 1980 *
- Canalith Repositioning
- Canalith debris → vestibule
- single treatment = 95% Remission
- Both anterior & posterior canal BPV.

http://www.earinfosite.org/about.htm
Epley Maneuver

Reclined head hanging 45 degree turn
Epley Maneuver

- Rotate 45 degrees contralateral
Epley Maneuver

Head and body rotated to 135 degrees from supine
Epley Maneuver

- Keep head turn and to sitting
- Turn forward chin down 20 degrees
Sleep semi-recumbent for the next two nights
Debris Deposited in Utricle; Patient Experiences Relief

Debris in Posterior Semicircular Canal

Hold for 30 seconds

Inner Ear (Right Side)

Posterior View

Anterior

Posterior

Lateral

Utricle

Crista Ampullaris

Semicircular Canals

Lateral View

Anterior

Lateral

Posterior

Semi-circular Canal Inverted

Hold for 30 seconds

Settling Debris Causes Nystagmus
Semont

- Liberatory maneuver
- 1st rapid single treatment
- 83.96% one maneuver 92.68% two
- 4.22% recurrence
- Others less success, too violent
**Brandt and Daroff exercises**

- Seated eyes closed
- Tilted laterally to precipitating position
- Lateral occiput resting
- Vertigo subsides
- Sit up for 30 sec
- Opposite head down position 30 sec
- Vertigo opposite (bilateral) maintain until resolves
- Every 3 hrs while awake, until 2 days free
Brandt and Daroff

- 66 of 67 relief 3-14 days
- Most 7-10 days
- 2 of 66 recurred and responded
- Non-responder had perilymph fistula
Brandt and Daroff
Brandt-Daroff Exercises

Position 1

Position 4

Position 2

Position 3

(c) 2001 Northwestern University
Non-Exercise Treatment

Medical:
- relieve of nausea, e.g. promethazine or prochlorperazine
- mastoid handheld vibrator

Surgical?
- occlusion of the affected canal.
- vestibular nerve section
- section of singular nerve
Singular Neurectomy

Gacek*

Anatomy

- Nerve exits lateral IAC singular canal
- Courses inf. and post. to PSCC ampula
- Inf-post to round window niche

Singular Neurectomy

- Lateral to RW membrane 50%
- Medial in 14-27%
- When medial significant risk to vestibule or cochlear basal turn
- Anatomic studies show inaccessible nerves clinical series rarely document difficulty
Singular Neurectomy

- Transcanal approach
  - Inferior scutum lowered if needed
  - RW overhang taken down
  - Immediate resolution of positional nystagmus
  - Most spontaneous nystagmus, downbeating, few days
Singular Neurectomy

- Published success 90%
- Persistent symptoms if nerve not definitively found
- Complications
  - Recurrent vertigo, SNHL
  - Severe SNHL 5%
  - Trauma, labyrinthitis
  - Mild SNHL 20%
- Only attempted by experience surgeons
PSCC Occlusion

- Prevents flow of endolymph
- Animal studies no effect on remaining vestibular organs

Procedure
- Cortical mastoidectomy
- Identify and blue-line canal
- Open with pick
- Occlude canal
  - Laser partitioning optional
  - Pack canal, bone wax, dust, fascia covering
**PSCC Occlusion**

- **Transient SNHL**
  - Detected intraoperatively by ECog
  - Recovers by 6-8 weeks
- **Mild SNHL persists 20%**
- **Post-op dysequilibrium for a few days/weeks**
- **Average in-patient stay 4.5 days**
- **Recurrent vertigo rare**
SSCC Dehiscence Syndrome

- 35 y male
- +ve FHx otosclerosis
- Tullio’s phenomenon?
- CT scan report: normal
- Stapedectomy failure for Lt CHL
SSCC Dehiscence Syndrome

- Dehiscence over SSCC
- Third mobile window
  - Tullio phenomenon
  - Hennebert's sign
SSCC Dehiscence Syndrome

History
- Vertigo with loud noise (Tullio’s phenomenon)
- Sneezing, coughing, valsala, lifting, autoinsufflation
- Occas. Constant dysequilibrium

Exam
- Vertical-torsional eye movement
- Fast-phase toward affected ear with positive pressure
SCDS

Diagnosis confirmed by high resolution CT

Conductive HL
  – Weber lateralizes to the affected ear
  – hear a tuning fork placed on foot
  – hearing their eye movements or
  – hearing their pulse

PTA
  – air conduction thresholds are normal
  – BC <0 dB normal hearing level (NHL).

Stapedectomy failure
Carey

- 1000 T-bones
- 5 specimens 0.5% complete dehiscence
  - 1 middle fossa floor
  - 4 superior petrosal sinus contact with canal
- Uniformly thin until 3 yrs of age
Vestibular-evoked myogenic potentials (VEMP)

- short-latency relaxation potentials evoked by clicks or by tone bursts are recorded from surface ipsilateral SCM EMG
- sacculus not cochlea
- SSCCD side has Lower threshold
3 kHz tone presented AD at 110 dBHL

- T
- V
- H

5 deg

Time (seconds)
Symptomatic
- Avoid offending stimuli

Debilitation symptoms ➟ surgery
- Middle fossa approach
- Trans-mastoid
- Care in raising dura
- Resurface, or occlude, optimal procedure not determined
Thank You