NOTES
BALANCE DISORDERS

GENERALLY, WHAT ARE THEY?

PATHOLOGY & CAUSES

- Disorders of inner ear (vestibular portion) → disequilibrium (balance loss)

CAUSES

- Inner ear infections, injuries; genetic disorders, others

SIGNS & SYMPTOMS

- Vertigo
  - Spinning sensation of oneself/ surroundings
- Hearing loss, tinnitus

DIAGNOSIS

DIAGNOSTIC IMAGING

- CT scan, MRI

OTHER DIAGNOSTICS

- Audiometric test
- Neurologic examination
- Clinical manifestation

TREATMENT

MEDICATIONS

- Antibiotics (causitive)
- Antihistamines, antiemetics, anticholinergics (symptomatic)

SURGERY

- Causative treatment

OTHER INTERVENTIONS

- Vestibular rehabilitation therapy

LABYRINTHITIS

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PATHOLOGY & CAUSES

- Inner ear (labyrinth) inflation
- Damage of auditory, vestibular-end organs responsible for hearing, retaining balance (rotational, linear-motion sensation)

CAUSES

- Viral infection (rubella virus, cytomegalovirus, mumps virus)
- Bacterial infection
  - *Streptococcus pneumoniae, Haemophilus influenzae, Neisseria meningitidis*; most commonly meningitis/otitis media complication
- Head injury, stress, allergy, medication

RISK FACTORS

- Upper respiratory tract infection

COMPLICATIONS

- Permanent hearing loss

SIGNS & SYMPTOMS

- Severe vertigo (oneself/surroundings seem spinning), associated symptoms
- Fatigue, nausea, vomiting
- Rotational motion signalization impairment → nystagmus
- Tinnitus, hearing loss
- Gait impairment

DIAGNOSIS

OTHER DIAGNOSTICS

- Head, neck examination
  - Nystagmus
- Neurologic examination
  - *Positive Romberg's test:* inability to maintain postural control
  - *Abnormal tandem gait:* inability to walk in straight line with one foot in front of other (heel-to-toe)
- Head impulse, Nystagmus, and Test of skew (HiNTs) examination
  - *Positive head-thrust test:* inability to maintain visual fixation when head turned rapidly toward side of lesion by examiner
  - Negative test of skew
  - Direction-changing nystagmus

TREATMENT

MEDICATIONS

- Inflammation
  - Corticosteroids
- Bacterial infection
  - Antibiotics
- Symptomatic treatment
  - Antihistamines, antiemetics, anticholinergics

OTHER INTERVENTIONS

- Self-limiting
  - Recovery in 1–6 weeks
- Vestibular rehabilitation therapy
  - Head, eye movement, postural change, walking exercise

MENIERE'S DISEASE

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PATHOLOGY & CAUSES

- Idiopathic inner-ear disorder
  - Vertigo, progressive hearing loss

CAUSES

- Exact cause unknown
  - Likely abnormal fluid, ion homeostasis in inner ear (endolymphatic hydrops)
- Possibly due to endolymphatic sac/duct blockage, viral infection, vestibular aqueduct hypoplasia, vascular constriction

RISK FACTORS

- Children
  - Congenital inner-ear malformations
- Family history (10% familial)

SIGNS & SYMPTOMS

- Spontaneous vertigo episodes (last 20 minutes–24 hours), associated symptoms (fatigue, nausea, vomiting); tinnitus, progressive hearing loss
- Less common
  - Drop attack (sudden fall with preserved consciousness)

DIAGNOSIS

OTHER DIAGNOSTICS

- Diagnostic criteria
  - Two/more unprovoked vertigo episodes (each last > 20 minutes)
  - Audiometrically-confirmed sensorineural hearing loss in affected ear on at least one occasion before/during/after vertigo episode
  - Tinnitus/fullness feeling in ear

TREATMENT

MEDICATIONS

- Symptomatic treatment
  - Antihistamines, antiemetics, anticholinergics

SURGERY

- Symptoms do not improve
  - Surgical decompression of endolymphatic sac

OTHER INTERVENTIONS

- Sodium restriction, diuretics may alleviate symptoms (unknown efficacy)

SCHWANNOMA

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PATHOLOGY & CAUSES

- Benign nerve-sheath Schwann cell tumor
- Involves any peripheral nerve
  - Most commonly affects head, neck nerves; vestibular nerve (vestibular schwannoma)
- Associated with neurofibromatosis type II (presents with bilateral schwannomas)
  - Caused by loss-of-function mutation in neurofibromin 2 (*NF2*) gene that encodes tumor-suppressor protein merlin (schwannomin)

RISK FACTORS

- Childhood radiation treatment

COMPLICATIONS

- Very rarely become malignant (neurofibrosarcoma degeneration)
- Left untreated
  - Brainstem compression, cerebellar tonsil herniation, hydrocephalus

SIGNS & SYMPTOMS

- Cochlear nerve involvement → hearing loss, tinnitus
- Vestibular nerve involvement → walking disequilibrium
- Trigeminal nerve involvement → facial paresthesia, hypoesthesia, pain
- Facial nerve involvement → facial paresis, gustatory disturbances; xerophthalmia, paroxysmal lacrimation, xerostomia

DIAGNOSIS

DIAGNOSTIC IMAGING

MRI

- Mass detection

OTHER DIAGNOSTICS

- Neurologic examination
  - Cranial nerve deficit
- Audiometry
  - Confirms sensorineural hearing loss

TREATMENT

SURGERY

- Excision

OTHER INTERVENTIONS

- Radiation therapy
  - Stereotactic radiosurgery, stereotactic radiotherapy, proton beam therapy

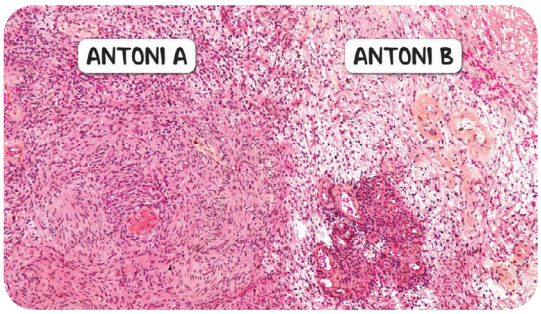

Figure 63.1 The histological appearance of a Schwannoma demonstrating characteristic Antoni A and Antoni B areas.

Figure 63.2 The gross pathology of an excised schwannoma.

VERTIGO

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PATHOLOGY & CAUSES

- Sensation that oneself/surroundings are spinning
  - Symptom, not disease
- Labyrinth, vestibular nerve, vestibular centers (in brainstem) damage/dysfunction

CAUSES

- Peripheral vertigo
  - Calcified otoliths in posterior semicircular canal (canalithiasis) → benign paroxysmal positional vertigo (most common)
  - Labyrinthitis, Ménière disease, herpes zoster oticus
- Central vertigo
  - Vestibular migraine; brainstem ischemia; cerebellar infarction, hemorrhage; multiple sclerosis

MNEMONIC: VOMITS

Causes of vertigo

Vestibulitis: labyrinthitis or vestibular neuronitis
Ototoxic drugs
Meniere's disease
Injury
Tumor
Spin: benign paroxysmal positional vertigo

SIGNS & SYMPTOMS

- Peripheral vertigo
  - Mild–moderate disequilibrium (dizziness, lightheadedness)
  - Spinning sensation; fatigue, nausea, vomiting; hearing loss, tinnitus, fullness, ear pain
- Central vertigo
  - Severe disequilibrium
  - Less prominent spinning sensation, nausea than peripheral vertigo
  - May be accompanied by neurologic deficits, nystagmus

DIAGNOSIS

DIAGNOSTIC IMAGING

MRI/CT scan

- Suspected central vertigo
  - Central nervous system abnormalities

OTHER INTERVENTIONS

Vestibular system function tests

- Differentiate vertigo from other dizziness causes
- Electronystagmography
- Dix–Hallpike maneuver
  - Individual sits, head rotated 45° towards ear being tested → individual lowered to supine past bed's end, extends neck 20° below horizontal → vertigo, nystagmus reproduced → test positive
- Head-thrust test
  - Individual fixates on target while head is rotated quickly → catch-up saccades, nystagmus → test positive

- Rotation test
  - Individual accelerates, decelerates in rotating chair → analyze postrotatory nystagmus → test positive
- Caloric reflex test
  - Cold/warm water/air irrigation into external auditory canal

Audiometry

- Assess hearing loss

TREATMENT

MEDICATIONS

- Vestibular migraines (underlying cause)
  - Anticonvulsants, beta blockers
- Symptomatic treatment
  - Antihistamines, antiemetics, anticholinergics, benzodiazepines

OTHER INTERVENTIONS

- Vestibular rehabilitation therapy