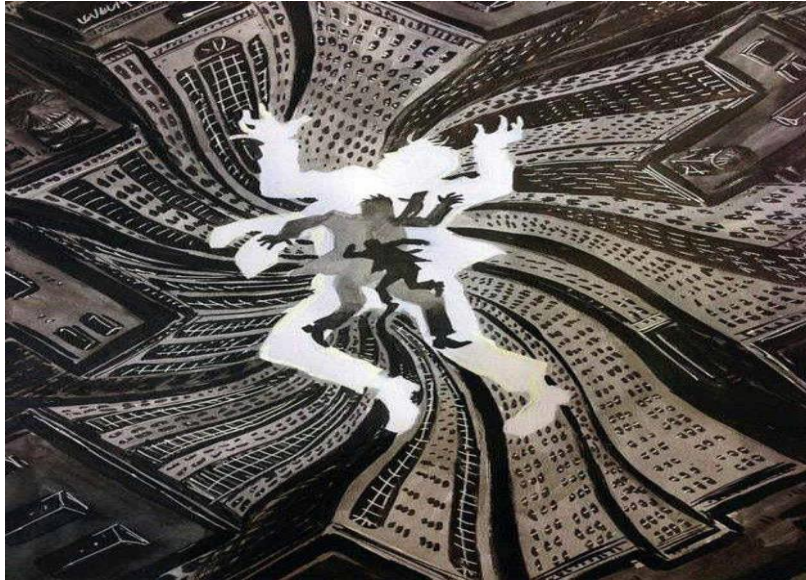




Vertigo



Objectives:

- To know anatomy of balance organs
- Physiology of balance
- Relevant history in dizzy patients
- Classification of vertigo
- Common peripheral causes of vertigo, clinical features, investigation and management
- Common central causes of vertigo, clinical features, investigation and management

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Correction File

**Color Index : Slides - Team 433 - Important Notes - Doctors' Notes - Lecture notes book p79
Toronto notes**

What are the components of balance system ?

- Inner ear(3 semicircular canals and otolith organ)
- Cerebellum
- vision(OVR)
- proprioception.

How does balance system work ?

Physiology: Function of vestibular system:

- Transform of the forces associate with head acceleration and gravity into a biological signals that the brain can use to develop subjective awareness of head position in space (orientation)
- produce motor reflexes that will maintain posture and ocular stability

It is not surprisingly that vestibular lesion cause:

- Imbalance.
- posture and gait imbalance.
- visual distortion (oscillopsia).

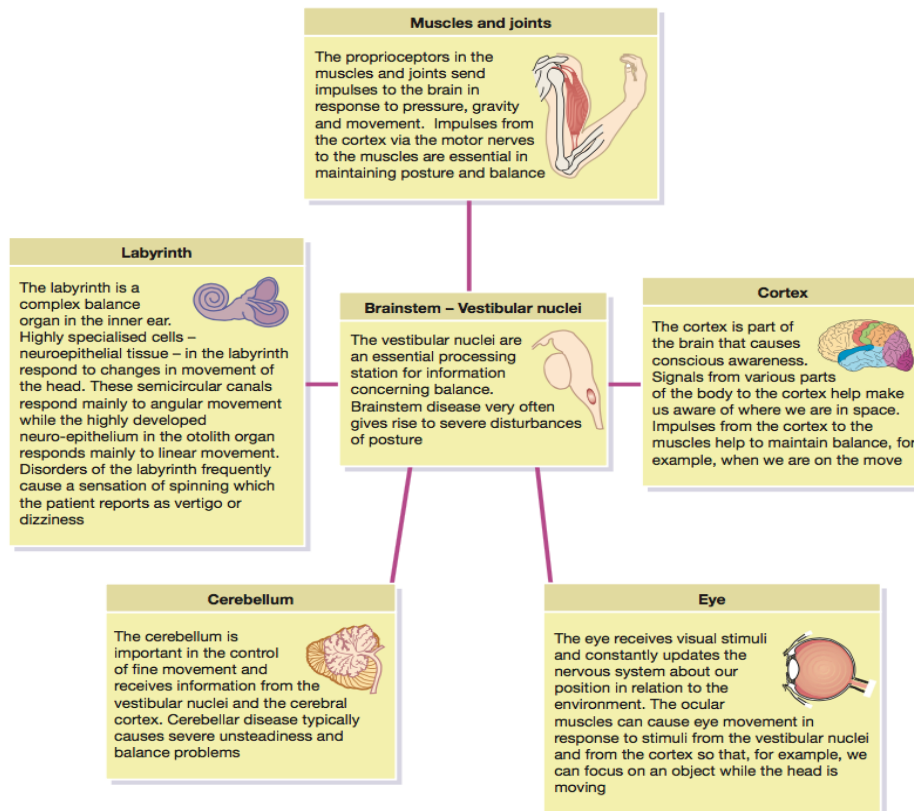


Figure 14.1 The control of balance. Source: Munir and Clarke 2013. *Ear, Nose and Throat at a Glance*. With permission of John Wiley & Sons Ltd.

What is Vertigo

- The word "vertigo" comes from the Latin "vertere", to turn + the suffix "-igo", a condition = a condition of turning about).
- It is an illusion of being moving or the world is moving too.

What is nystagmus ? is a condition where the eyes move rapidly and uncontrollably. They can move: side to side (horizontal nystagmus) up and down (vertical nystagmus) in a circle (rotary nystagmus)

What are the questions to ask in history?

(History is the most important key to diagnosis for a patient with dizziness)

- onset
- Frequency: -Recurrent - Non-Recurrent
- Duration - Seconds - Minutes - Hours to days
- Associated auditory symptoms: Tinnitus -Deafness -Fullness
- Aggravating and relieving factors: Rolling over in bed, Getting up from bed, Looking up, Consume salty food.
- Ear disease or ear surgery
- Trauma
- Migraine
- Ototoxic drug intake

investigations:

- PTA
- Vestibular testing
- CT SCAN
- MRI

Differential diagnosis:

Disorders of vestibular system cause vertigo and are divided into:

1. **Peripheral vestibular loss:** which involve vestibular end organs and their 1st order neurons (i.e. the vestibular nerve). The cause lies in the internal ear or the vestibulocochlear nerve . They are responsible for 85% of all cases of vertigo.
2. **Central vestibular loss:** which involve central nervous system after the entrance of vestibular nerve in the brainstem and involve vestibulo-ocular, vestibulospinal and other central nervous system pathways.

Peripheral vestibular loss: dr saied these are the most important things to know about peripheral loss

- 1-Vestibular neuritis
- 2-benign paroxysmal position vertigo(BPPV)
- 3-Ménière's disease(Endolymphatic hydrop)

1-Vestibular neuritis

Vestibular neuronitis: inflammation of the vestibular portion of CNVIII

labyrinthitis: inflammation of both vestibular and cochlear portions

Self-limited disease caused by infection or autoimmune lead to inflammation of the vestibular nerve PT has severe attack of vertigo last for hours to days associated with nausea and vomiting, its improve gradual with time (الدوار في اليوم الثاني يتحسن عن اول يوم).

- Viral infection of vestibular organ (e.g. measles, mumps, herpes zoster) or post-viral syndrome
- Affect all ages but rare in children only ~30% of cases have associated URTI symptoms
- Affected patient presents acutely with spontaneous nystagmus ,vertigo and nausea & vomiting
- Patient requires only symptomatic treatment
- It takes 3 weeks to recover from vestibular neuritis

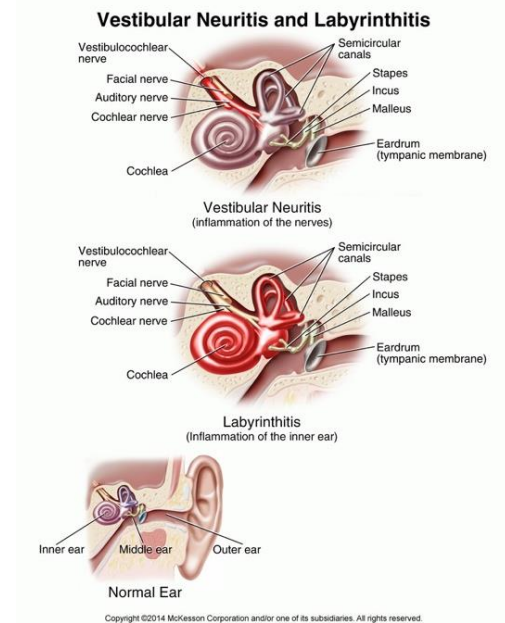
Clinical Features

- acute phase
 - severe vertigo with N/V and imbalance lasting 1-5 d
 - irritative nystagmus (fast phase towards the offending ear)
 - ataxia: patient tends to veer towards affected side
 - tinnitus and hearing loss in labyrinth
- convalescent phase
 - imbalance and motion sickness lasting days to weeks
 - spontaneous nystagmus away from affected side
 - gradual vestibular adaptation requires weeks to months

Diagnosis:hx. Examination spontaneous nystagmus

Treatment antiemetic, rehydration, steroids for autoimmune

- acute phase
 - bed rest, antivertiginous drugs
 - corticosteroids (methylprednisolone) ± antivirals
 - bacterial infection: treat with IV antibiotics, drainage of middle ear, ± mastoidectomy
- convalescent phase
 - progressive ambulation especially in the elderly
 - vestibular exercises: involve eye and head movements, sitting, standing, and walking



Drop Attacks (Tumarkin's Otolithic Crisis) are sudden falls occurring without warning and without LOC, where patients experiences feeling of being pushed down into the ground



Before proceeding with gentamicin treatment, perform a gadolinium enhanced MRI to rule out CPA tumour as the cause of symptoms

2-benign paradoxical position vertigo

Due to canalithiasis (migration of free floating otoliths within the endolymph of the semicircular canal) or cupulolithiasis (otolith attached to the cupula of the semicircular canal) crystals moves to the posterior canal is affected in >90% of cases (most common) and cause short vertigo provoked by position, no auditory symptoms.

- The most common cause of vertigo in patient > 40 years most common form of positional vertigo (50% of patients with peripheral vestibular dysfunction)
- Repeated attacks of vertigo usually of short duration less than a minute .
- Provoked by certain positions (rolling in beds, looking up, and head rotations)
- Not associated with any hearing impairment

Causes:

- head injury,
- viral infection (URTI),
- degenerative disease
- idiopathic

Diagnosis:

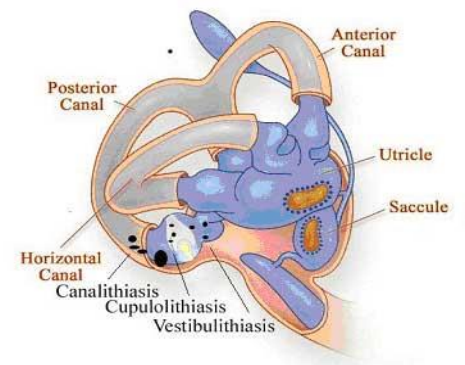
History

Dix-Hallpike maneuver: [Video](#)

(the patient is rapidly moved from a sitting position to a supine position with the head hanging over the end of the table, turned to one side at 45° and neck extended 20° holding the position for 20 s) onset of vertigo and rotary nystagmus indicate a positive test for the dependent side)

treatment :pt in spine position then rotate head 90 degree to the non-effected side then again 90 degree same direction then put the pt in sitting position this is called **Epley maneuver** ([video](#))

- reassure patient that process resolves spontaneously
- particle repositioning maneuvers
 - Epley maneuver (performed by MD or by patient with the help of devices such as the DizzyFIX™)
 - Brandt-Darof exercises (performed by patient)
- surgery for refractory cases
- anti-emetics for N/V
- drugs to suppress the vestibular system delay eventual recovery and are therefore not used



BPPV is the most common cause of episodic vertigo; patients often are symptomatic when rolling over in bed or moving their head to a position of extreme posterior extension such as looking up at a tall building or getting their hair washed at the hairdresser



Signs of BPPV seen with Dix-Hallpike Maneuver

- Latency of ~20 s
- Crescendo/decrecendo vertigo lasting 20 s
- Geotropic rotatory nystagmus (nystagmus MUST be present for a positive test)
- Reversal of nystagmus upon sitting up
- Fatigability with repeated stimulation

3-Ménière's disease

Pathophysiology :

Unknown etiology

↑ ↓ production of fluid within inner compartment inadequate absorption of endolymph leads to endolymphatic hydrops (over accumulation) that distorts the membranous labyrinth

last minute to hour and associated with hearing loss, fullness of the ear and tinnitus

- **vertigo** (minutes to hours) vertigo disappears with time (min to h), but hearing loss remains
- **Low frequency fluctuating SNHL**
- **Tinnitus and fullness in the ear.**
- early in the disease: fluctuating SNHL
- later stages: persistent tinnitus and progressive hearing loss
- In 10 - 20% of cases the disease later involves the opposite ear **must monitor** opposite ear as bilaterality occurs in 35% of cases
- peak incidence 40-60 yr **more in male**
- ± drop attacks (Tumarkin crisis), ± N/V
- attacks come in clusters and can be debilitating to the patient
- triggers: high salt intake, caffeine, stress, nicotine, and alcohol
- -Severe attacks may be accompanied by other symptoms of vagal disturbances such as abdominal cramps, diarrhea, cold sweats, pallor and bradycardia
- -Some cases of Ménière's disease show *Tullio phenomenon*. It is a condition where loud sounds or noise produce vertigo and is due to the distended saccule lying against the stapes footplate

Diagnosis: **hx and hearing test**

-History

-PTA(pure tone audiometry)

one of the differential is acoustic neuroma tumors (العصب السمعي) so do MRI to rule it out

Management:

acute management may consist of bed rest, antiemetics, antivertiginous drugs (e.g. betahistine, meclizine, dimenhydramine), and anticholinergics (e.g. scopolamine)

-low-salt diet diuretics (e.g. hydrochlorothiazide, triamterene, amiloride)

-Medical therapy

intratympanic gentamicin to destroy vestibular end-organ, results in complete SNHL

intratympanic glucocorticoids (e.g. dexamethasone) may improve vertigo symptoms

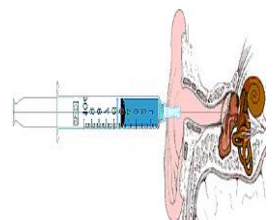
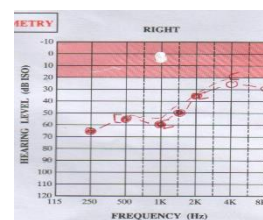
- Meniett device's [\(video\)](#)

-Chemical perfusion



Diagnostic Criteria for Ménière's Disease (must have all three):

- Two spontaneous episodes of rotational vertigo ≥ 20 minutes
- Audiometric confirmation of SNHL (often low frequency)
- Tinnitus and/or aural fullness



Conc management of Ménière's disease:

-Surgery

selective vestibular neurectomy or labyrinthectomy

potential benefit for endolymphatic sac decompression or sacculotomy

Diagnosis	Duration of attack	hearing	Course of diseases	Treatment
Vestibular N	Days	normal	Self limited	Symptomatic
BPPV	Seconds	normal	Recurrent	Exercise
Meneire's diseaseM	Minutes to hours	Affected	Recurrent	Medical & surgical

Central vestibular loss:

- CVA (Cerebero vascular accident)
- Brain tumor (acoustic neuroma)
- Multiple sclerosis
- Ms tumors migrane ,schwannoma



Acoustic neuroma is the most common intracranial tumour causing SNHL and the most common cerebellopontine angle tumour

CVA:

Elderly patient with chronic disease like (DM ,HTN) with sudden attack of vertigo +neurological symptoms

Vertigo is abrupt in onset, lasts several minutes and is associated with nausea and vomiting. Other neurological symptoms like visual disturbances, drop attacks, diplopia, hemianopia, dysphagia and hemiparesis resulting from ischaemia to other areas of brain may also accompany vertigo.



In the elderly, unilateral tinnitus or SNHL is acoustic neuroma until proven otherwise

Acoustic tumor: (Vestibular Schwannoma)

Benign tumor

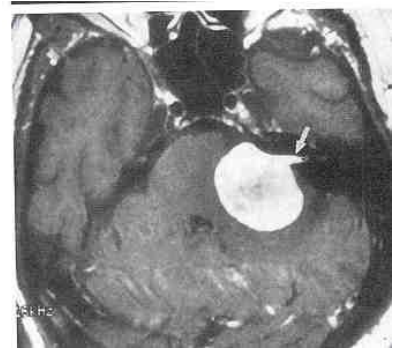
Arise from vestibular division of VIII

Clinical presenatation:

- Unilateral tinnitus or SNHL
- Hearing loss
- Dizziness and unsteadiness may be present, but true vertigo is rare as tumour growth occurs slowly and thus compensation occurs
- facial nerve palsy and trigeminal (V1) sensory defcit (corneal reflex) are late complications
- risk factors: exposure to loud noise, childhood exposure to low-dose radiation, history of parathyroid adenoma

Pathogenesis of Vestibular Schwannoma

- starts in the internal auditory canal and expands into cerebellopontine angle (CPA), compressing cerebellum and brainstem
- when associated with type 2 neurofibromatosis (NF2): bilateral acoustic neuromas, juvenile cataracts, meningiomas, and ependymomas



Diagnosis :

- History
- PTA (Unilateral SNHL)
- Radiology MRI with gadolinium contrast (gold standard)
- poor speech discrimination relative to the hearing loss
- stapedial reflex absent or significant reflex decay
- ABR: increase in latency of the 5th wave
- vestibular tests: normal or asymmetric caloric weakness (an early sign)

Treatment

- • expectant management if tumour is very small, or in elderly
- • definitive management is surgical excision
- • other options: gamma knife, radiation

A dizzy patient may fit into one of the following scenarios

Scenario # 1

The patient who is having a first ever attack of acute spontaneous vertigo.

- Acute vestibular neuritis
- cerebellar infarction.

How to differentiate ?

- Clinically (General appearance of patient /nystagmus/head impulse test)
- Radiology

Scenario #2

The patient who has repeated attacks of vertigo, but is seen while well

A- Recurrent spontaneous vertigo

- Menière's disease
- Migraine induced vertigo
- perilymph fistula

B- Recurrent Positioning Vertigo

- BPPV

Scenario #3

The patient who is off balance

- Bilateral vestibulopathy
- normal pressure hydrocephalus.
- posterior fossa tumour

Table 5. Peripheral vs. Central Vertigo

Symptoms	Peripheral	Central
Imbalance	Moderate-severe	Mild-moderate
Nausea and Vomiting	Severe	Variable
Auditory Symptoms	Common	Rare
Neurologic Symptoms	Rare	Common
Compensation	Rapid	Slow
Nystagmus	Unidirectional Horizontal or rotatory	Bidirectional Horizontal or vertical

Table 6. Differential Diagnosis of Vertigo Based on History

Condition	Duration	Hearing Loss	Tinnitus	Aural Fullness	Other Features
Benign Paroxysmal Positional Vertigo (BPPV)	Seconds	–	–	–	
Ménière’s Disease	Minutes to hours Precedes attack	Uni/bilateral, fluctuating	+	Pressure/warmth	
Labyrinthitis/Vestibular Neuronitis	Hours to days	Unilateral	±Whistling	–	May have recent AOM
Acoustic Neuroma	Chronic	Progressive	+	–	Ataxia CN VII palsy

Table 7. Differential Diagnosis of Vertigo Based on Time Course

Time Course	Condition
Recurrent, lasting	BPPV
Single episode, lasting minutes to hours	Migraine, transient ischemia of the labyrinth or brainstem
Recurrent to hours	Ménière’s
Prolonged	Vestibular neuritis, MS, brainstem/cerebellum infarct
Acoustic neuroma	Chronic