Balance Disorders

Cambodia 2018

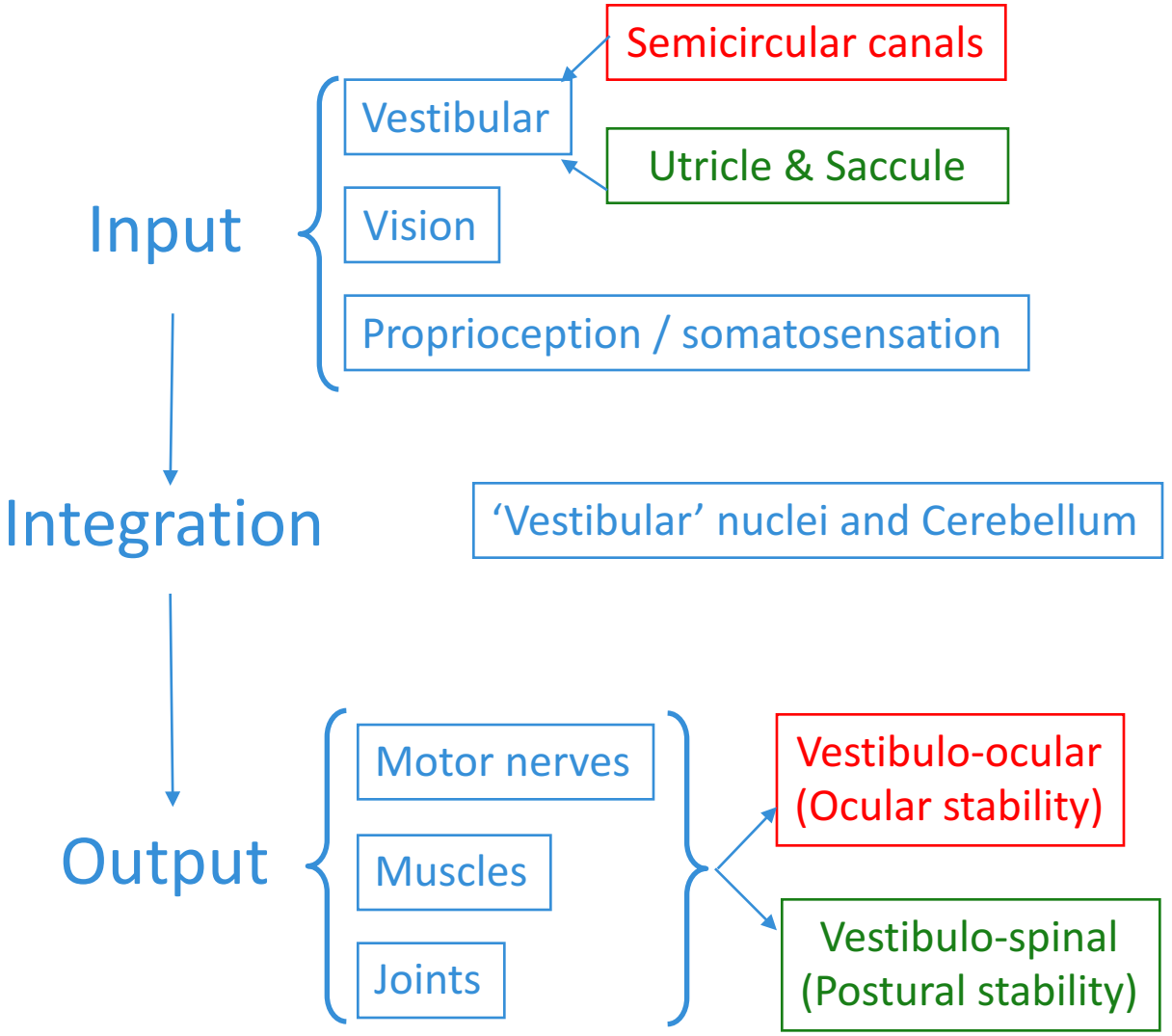
S Browning

Kahoot!

- What do you know already?

Look at this Diagram…

- What diseases might cause balance problems?
  - Give one or two examples from each blue box



Input problems

- Eyes
  - Change in vision or failing vision, and poor perception in the dark may lead to imbalance and falls
  - New prescriptions can cause imbalance
- Ears
  - Damaged ears from infection, clot or trauma can cause acute severe spinning
  - Ageing ears have less well functioning gravity and movement sensors
  - Ototoxic drugs
- Somatosensory / proprioception
  - Poor sensation in feet and ankles, e.g. diabetes, means poor detection of sway
  - Damaged ankles and knees don’t feedback so well
  - Causes a sense of instability

‘Integration’ problems

- Ageing brain
- Drugs
- Fatigue
- Cerebellar degeneration
- Stroke
- Low blood pressure
- Migraine
- Multiple sclerosis, Parkinson’s disease
- Tumour
- Intracranial hypertension

Output problems

- Anything affecting nerves, muscles and joints can affect balance.
- Slow nerve conduction velocities mean that the patient can sense changes quickly or react to them quickly
- Weak muscles mean that any muscular reaction may be inadequate to prevent a fall
- Stiff joints or painful ones are not reliable for muscles to work around so patients may fall

Ageing

- Causes problems everywhere!
  - Slow nerve conduction
  - Weak muscles
  - Stiff joints
  - ‘Presby-balance’
  - Failing eyesight and worse depth perception
  - Integration slows, too
  - Poor regulation of blood pressure

Causes of Vertigo 50% are ear related

Peripheral - Ear

Benign Paroxysmal Positional Vertigo (BPPV)

Ménière's Disease

Vestibular Neuritis

Labyrinthitis

Central - Brain

Migraine

Multiple Sclerosis

Posterior Circulation stroke

Others

Cardiovascular

Drug related

Other medical

History and Examination

- What do you think are the important symptoms to elicit during a history?

- What are the elements of the examination? Name as many things to look for as you can.

History

- When taking a history from someone who is suffering with balance disturbance you must consider:
  - The ears, eyes, brain, muscles, joints and nerves
  - Drugs, cardiovascular system, psychology
  - Age

- Diagnosis is made easier by considering timings, triggers and associated symptoms.
- Diagnosis is supported by physical examination which should focus on specific clinical features.

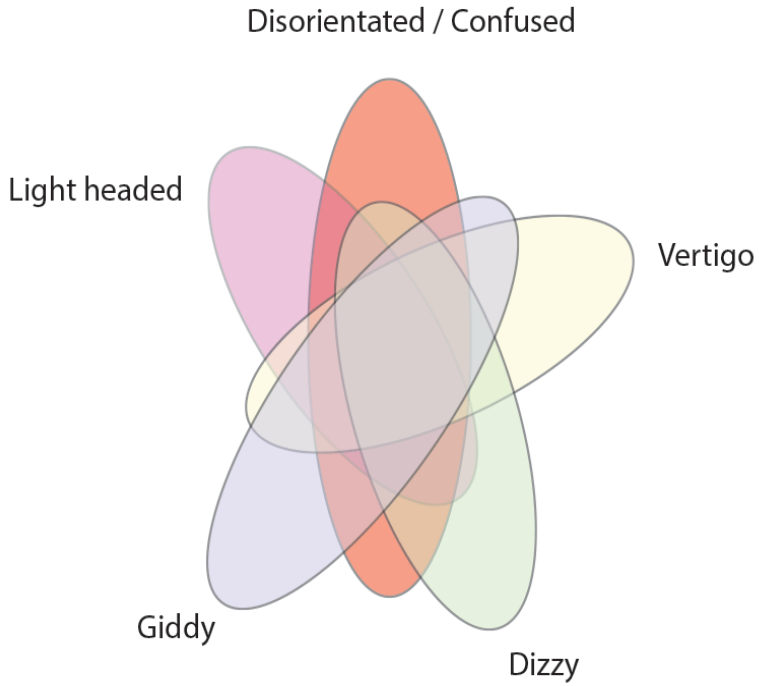
More History

- Hearing loss
- Tinnitus
- Otalgia – ear pain
- PMH of ear disease or vertigo
- Duration of the attack
- Other symptoms associated with the attack
- Cardiovascular symptoms
- Neurological symptoms
- Psychological
- Drugs
- Head trauma, ageing,

- Neuro-
  - headache / migraine
  - Weakness, paralysis, numbness
  - Visual disturbance
  - Tremor
  - Epilepsy – taste, smell, hallucination
  - Swallowing, voice or articulation problems
  - Loss of consciousness
  - Facial palsy
- Psychiatric
  - Anxiety, palpitations, shortness or breath
  - Pallor, sweating, diarrhoea
  - Depression
- Cardiovascular
  - Chest pain, palpitations

“What do you mean by ‘dizzy’?”

- Patient’s descriptions of their symptoms are not reliable
- Type of dizziness is not a reliable discriminator in diagnosis



- Kerber & Newman Tocker 2015

Taking a history

- Patient's description of vertigo / dizziness is highly variable and does not reliably discriminate between different causes

- Concentrate on:
  - *Timing – how long does it last, what else happens with it?*
  - *Triggers –what brings an attack on?*
    - *NB. Most causes of dizziness are made worse by head movement*

- Take care with stroke risk factors – not having any does not mean that there hasn't been a stroke. A stroke can look a lot like vestibular neuritis.

Timing and Associations

- How long does the attack last: seconds, hours, days/weeks?
- Is it associated with other symptoms at the same time?
  - Hearing loss +/- tinnitus, aural discharge (ear)
  - Slurring of speech, facial weakness, paraesthesia, loss of consciousness, headache, double vision (brain)
  - Palpitation, shortness of breath (?heart ?anxiety, stress)

Triggers

- What brings the attack on?
  - Rolling in bed, looking up to a shelf, lying down/sitting up?
  - Sudden and spontaneous?
  - Standing up from a chair or bed?
  - Anxiety?
  - Visual stimulation?

Drugs causing balance disturbance

- Aminoglycosides
- Loop Diuretics – furosemide
- Vancomycin
- Antineoplastics – cisplatin, cyclophosphamide
- Quinine and quinidine
- Salicylates and NSAIDs
- Antibiotics
  - Quinolones, erythromycin, tetracycline, mefloquine
- Antihypertensives
- Neuroleptics (antipsychotics)
- Antidepressants
  - Tricyclic and MAOs
- Hypnotics and sedatives
- Alcohol
- Anticonvulsants
- Drugs for Parkinson’s
- Drugs for vertigo

Very Important Point…

- Isolated vertigo – vertigo with no other symptoms - is probably not caused by a neurological disorder
- Vertigo with associated hearing loss and tinnitus is probably due to ear disease
- Vertigo with any of the following is neurological;
  - Facial weakness, severe headache, double vision, blindness, slurring of speech, inability to stand, weak arm or leg, numb arm, leg or face, loss of bladder function, new incoordination, difficulty swallowing

What are the common ear causes of vertigo?

- 1
- 2
- 3
- 4

What are their features?

Causes of Vertigo 50% are ear related

Peripheral - Ear

- Benign Paroxysmal Positional Vertigo (BPPV)
  - Commonest by far
  - Curable
- Ménière's Disease
  - Over diagnosed but probably second commonest
- Vestibular Neuritis
  - Third. No hearing loss with this one
- Labyrinthitis
  - Least common but most frequently diagnosed
  - Comes with sensory deafness

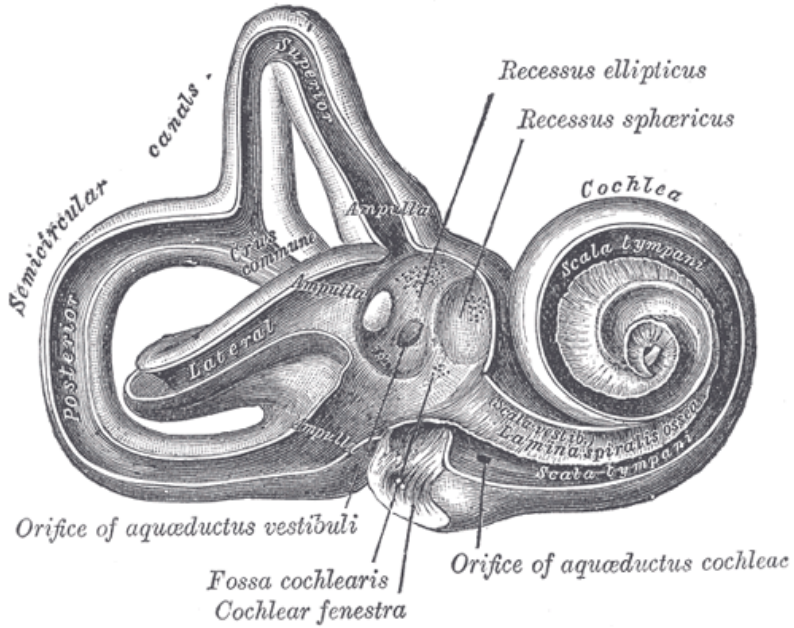
Telling Vestibular Diseases Apart

	Duration of Vertigo	**Hearing loss**	**Tinnitus**	**Other neurological symptoms**
BPPV	Seconds	No	No	No
Meniere's	Hours - day	Yes	Yes	No
Vestibular Neuritis	Days - weeks	No	No	No
Labyrinthitis	Days - weeks	Yes	Yes	No
CVA	Days - weeks	No	No	Yes - usually

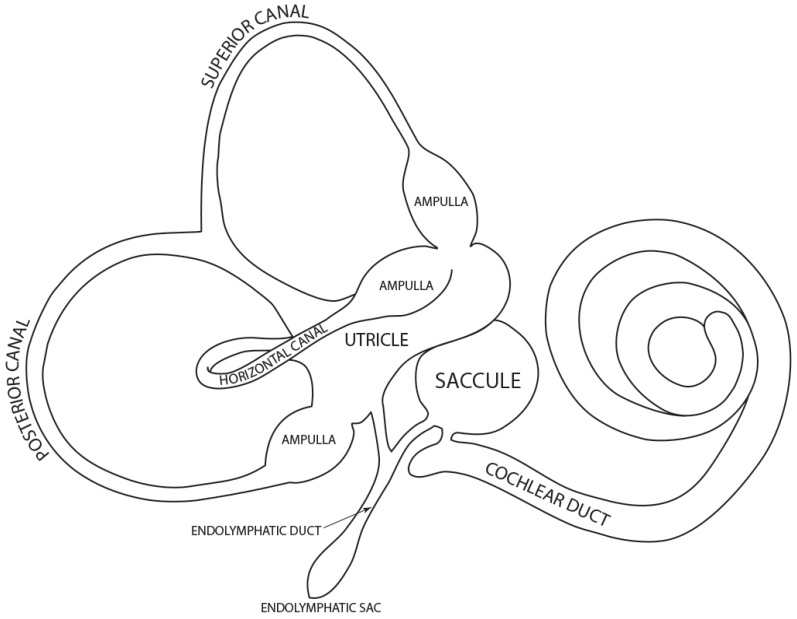
This is a simplification. Accurate diagnosis requires deeper questioning and a good examination

Anatomy

Bony Labyrinth



Membranous labyrinth



http://www.bartleby.com

Ménière's Disease

- Ménière's affects the whole of the endolymphatic space causing (hearing loss and tinnitus)

Ménière's Disease

- Less common than BPPV (but over diagnosed)
- Vertigo lasts for hours or a day
- Hearing loss and tinnitus are associated with it
- No otalgia or otorrhoea
- No specific provocation

- Typical attack:
  - Aural pressure
  - Tinnitus
  - Hearing loss
  - Vertigo
  - Nausea, vomiting, sweating

Diagnosing Ménière's Disease

- Characteristic History
  - Partly possible in Primary Care

- Excluding tests
  - MRI (Acoustic neuroma, posterior fossa SOL)
  - Blood tests (Anaemia, syphilis, autoimmunity)

- Supportive tests
  - Pure Tone Audiogram (fluctuating low frequency sensory deafness)
  - Vestibular Function Tests (occasionally helpful)

Curing Ménière's - trickier

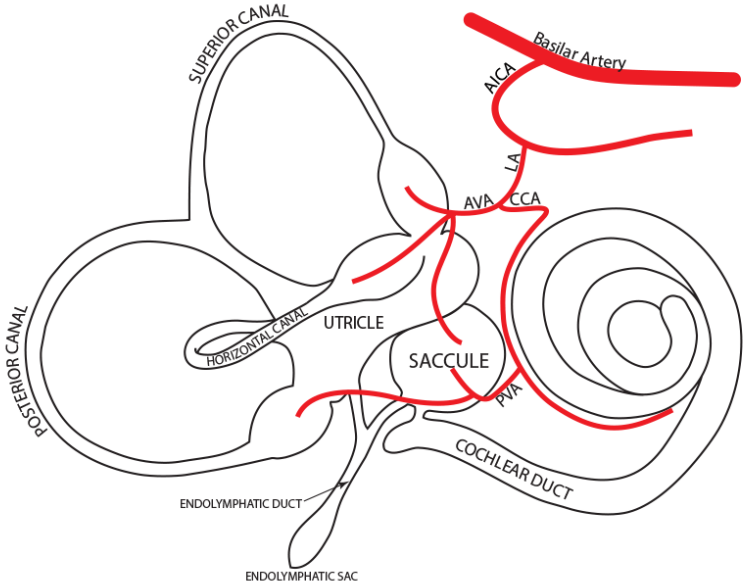
- Dietary changes
  - Reduce salt
- Medical therapy
  - Acute attacks – prochlorperazine
  - Prevention - betahistine

- Conservative surgery therapy if hearing is good
  - Grommets, intratympanic steroids, chemical labyrinthectomy, vestibular nerve section
- Ablative surgery if hearing is poor
  - Bony labyrinthectomy

What is the day-to-day management of Ménière's?

- Nothing usually
- Need psychological support at times
- Need to manage stress (as it can be a trigger)
- Need advice on salt consumption
- Require repeat prescriptions
- Sometimes need to be referred to ENT for further opinion on management

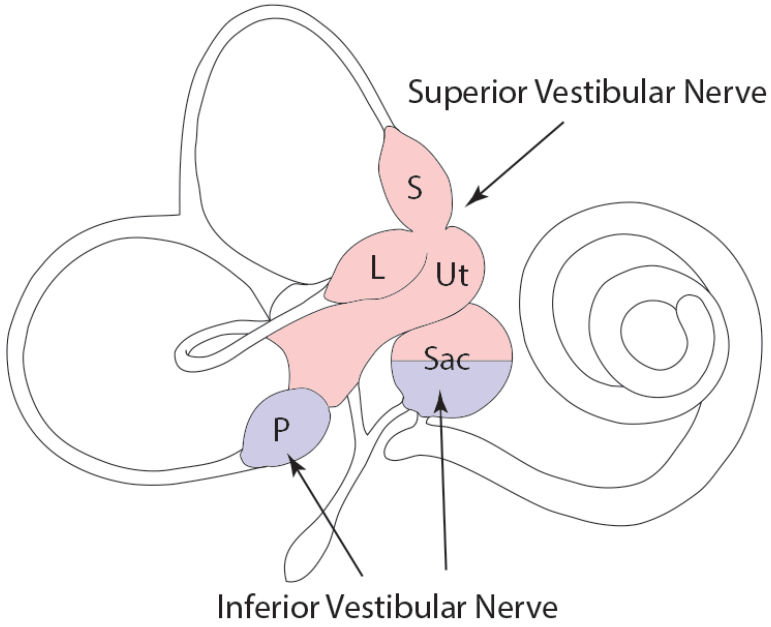
Vascular Anatomy



- BA= basilar
- AICA=anterior inferior cerebellar
- CCA= common cochlear
- AVA= anterior vestibular
- PVA= posterior vestibular
- LA = labyrinthine

- End artery system

Anatomy



- Superior Vestibular Nerve – Superior SCC, Lateral SCC, Utricle
- Inferior Vestibular Nerve – Posterior SCC, Saccule
- Cochlear Nerve - Cochlea

Vestibular Neuritis (NOT Neuronitis!)

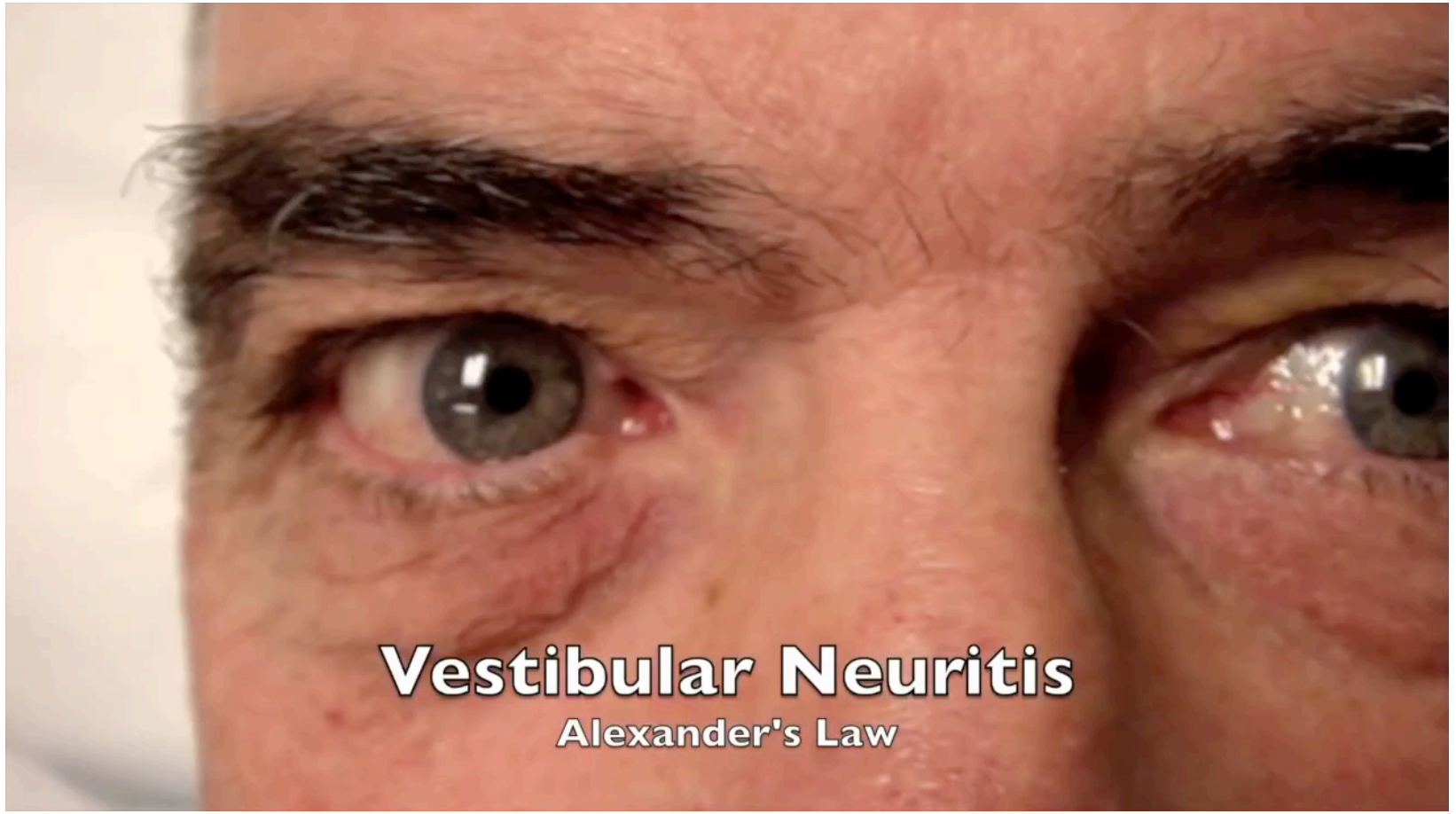
- Ménière's affects the whole of the endolymphatic space (cochlear symptoms as well as vertigo)

- Vestibular Neuritis affects the vestibular nerve only (no cochlear symptoms)

Vestibular Neuritis

- Severe vertigo, nausea and vomiting for a few days followed by gradual resolution and normality within 6 weeks but
- Elderly, on medication, poor eyesight, poor joint mobility or muscle strength can conspire to prevent full recovery.
- 10% go on to develop BPPV afterwards

Horizontal Nystagmus and Alexander’s Law



Head Impulse Test - Abnormal

Labyrinthitis – a disease of the labyrinth (all of it)

Labyrinthitis

- Severe vertigo, nausea and vomiting for a few days followed by gradual resolution and normal balance within 6 weeks. Hearing loss and tinnitus also
- Elderly, on medication, poor eyesight, poor joint mobility or muscle strength can conspire to prevent full recovery.
- 10% go on to develop BPPV afterwards

- This is an uncommon disease

Day-to-day management of VN and Labyrinthitis

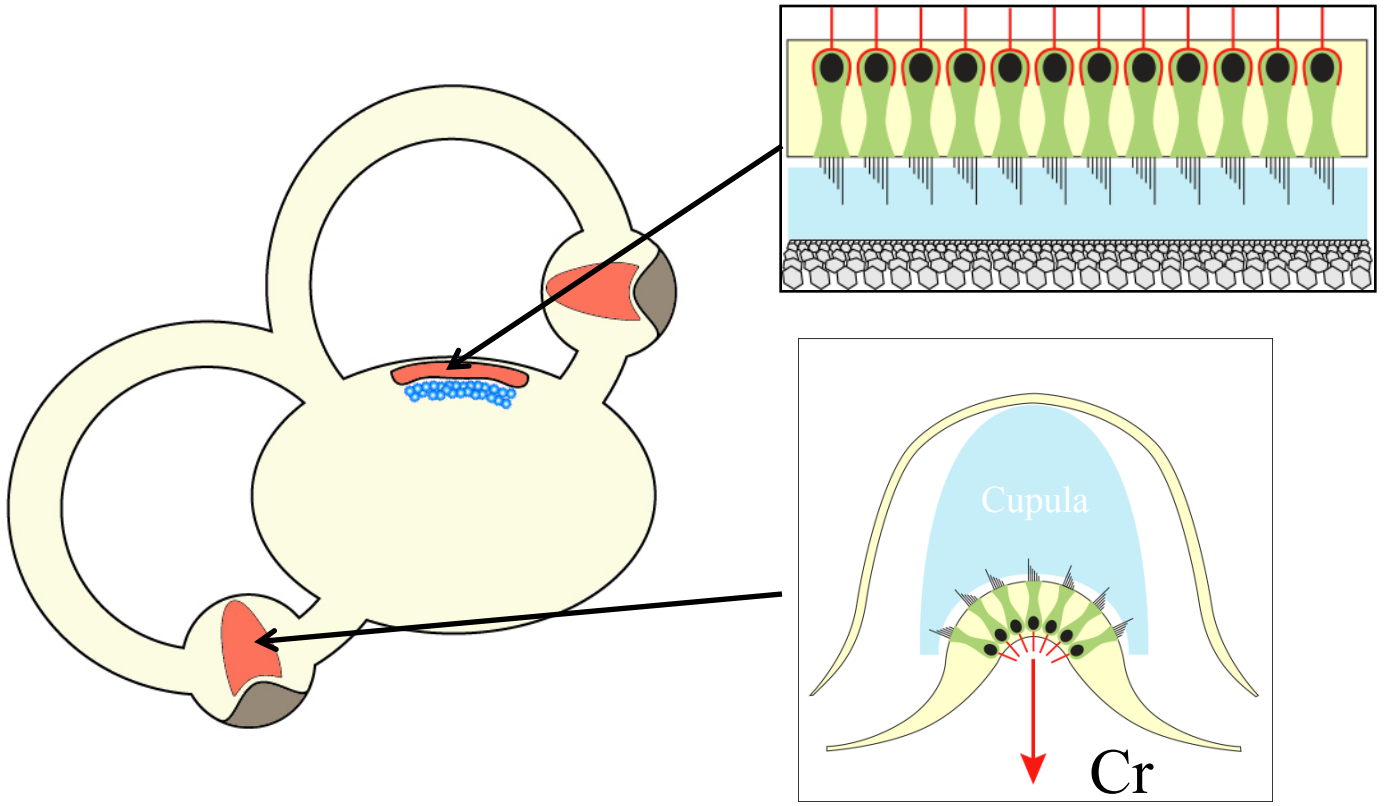
- Provision of short term anti-sickness medications
- Advice on balance rehabilitation exercises
- Review of progress against mobility goals
- Prescription of physiotherapy
- Advice on home environment
- Referral for hearing assistance or tinnitus management
- Diagnosis and management of BPPV if it arises
- Patient education and motivation

BPPV

- The commonest cause of isolated vertigo
  - No deafness, no tinnitus, no otorrhoea, no otalgia
  - Elderly populations may have these as separate problems
- Vertigo lasts for seconds
  - Patient may say up to a minute
- Occurs after specific movements only
  - Movements in the vertical plane e.g. looking up or down, arising from bed
  - Rolling over in bed
- May present with vague imbalance as well

It’s the only easily curable form of vertigo and should be 1A! Currently its hidden from you under ‘Vertigo 2B’

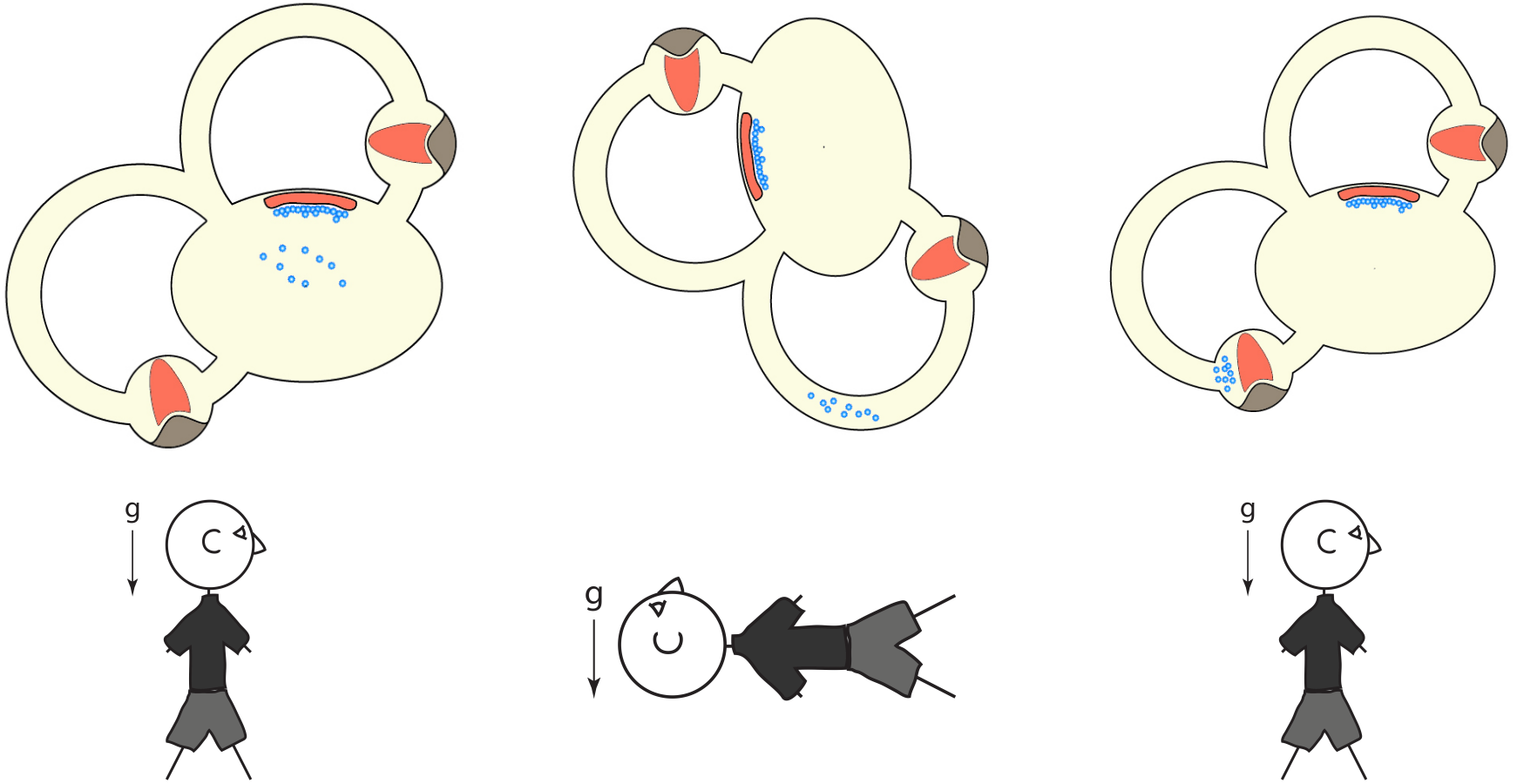
Crista and Maculae



The Macula

The Crista

Otoconial Displacement



The posterior semicircular canal is in the same vertical orientation as the pinna

Displaced Otoconia

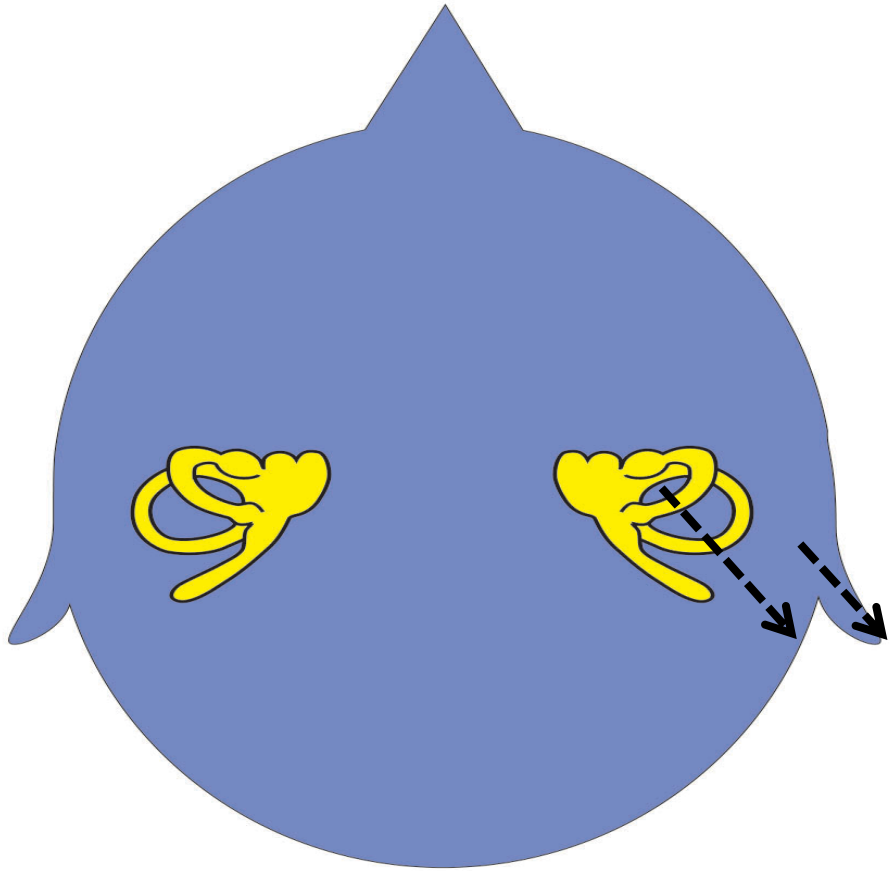
- Otoconia in the PSCC cause:
  - The sensation of spinning associated with certain movements
  - A vague sense of imbalance especially when upright

Diagnosis

Uncommon presentations of common diseases are more common than uncommon diseases

- BPPV is very common and is underdiagnosed
- It can present in atypical ways and patient descriptions aren’t reliable
- So always consider it and perform a Dix Hallpike or side lying test

Orientation of Posterior Canal



- The commonest canal to suffer with BPPV is the posterior canal
  - 95% PSCC, 4% LSCC, 1% SSCC
- It lies in a vertical plane that is approximately that of the normal pinna
- Use the pinna as a guide to your manoeuvres

Diagnostic manoeuvres

- Dix Hallpike or side-lying test
  - Highly specific
  - Quite sensitive
- Requires a quick movement in the plane of the PSCC
- Test outcomes are: nystagmus and / or a sense of vertigo
- The characteristics of the nystagmus are important

Both work well and side lying test is very suited to patients who cant lie flat on their back with an extended neck

Absolute Contraindications

- Neck Surgery and recent neck trauma
- Severe Rheumatoid Arthritis
- Atlantoaxial and occipitoatlantal instability
- Cervical myelopathy and radiculopathy
- Carotid sinus syncope
- Arnold-Chiari

Rapid Assessment of Safety to Proceed

- Ask if there is neck pain or stiffness
- Turn the head 45^0 L or R. If this can be done for 30s without pain or light-headedness then side lying test is possible
- Turn the head 45^0 L or R and extend the neck. If this can be done for 30s without pain or light-headedness then both the Dix-Hallpike and side lying tests are possible

Other difficulties include obesity, orthopnoea, frailty, back stiffness and pain

Dix Hallpike & Side Lying Test

Objective BPPV

- Physical signs
  - Typical nystagmus
- Symptom of vertigo
  - Follows pattern of nystagmus

Subjective BPPV

- No physical signs
- Symptom of vertigo
  - Follow the expected pattern of nystagmus even though the nystagmus is absent

No nystagmus does not mean no BPPV. If the patient has symptoms that are provoked by the manoeuvre and behave typically they probably have BPPV

Dix-Hallpike Manoeuvre

Demonstration of safety test and Dix Hallpike

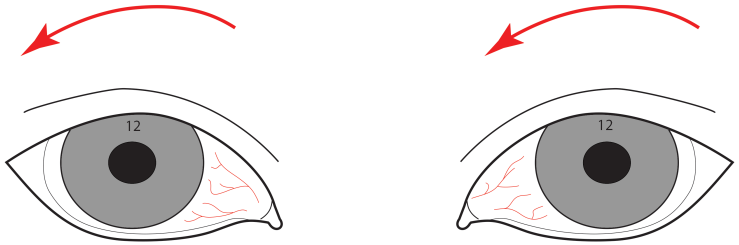
YouTube video

What to look for

- Latent period – a second or two usually
- Geotropic torsional nystagmus
- Nystagmus stops in a few seconds
- Reversibility – difficult to observe in most patients
- Fatigability – repeat the exam and the signs disappear

In subjective BPPV one sees a latent period followed by vertigo for seconds and fatigability

Geotropic Torsional Nystagmus



- A rotatory movement of 12 o clock towards the floor
- Use a blood vessel or a mark on the iris

Nystagmus of Left Posterior Canal BPPV

Curative Manoeuvres

- Epley Manoeuvre
- Brandt Daroff exercises
- Semont Manoeuvre

Epley

- Check for restrictions in the neck and contraindications
- Explain procedure
- Done once by the clinician
- 80 - 93% cure rate
- Post-Epley restrictions (sleep upright for two days, don’t bend down)
- 30% recurrence rate

Summary of Important Points on BPPV

- BPPV is very common as a cause of vertigo even if the symptoms are atypical
- Always do a Dix Hallpike or Side Lying test – whichever is safer for the patient because you can diagnose atypical cases this way
- Remember that the pinna is in the same orientation as the PSCC on the same side
- The test may be objectively or subjectively positive

Questions Please

Video

- https://www.youtube.com/watch?v=KLt2LtISPmQ
  - Video section 1 and 4
- Geotropic Nystagmus
- Horizontal Nystagmus

Bibliography

- Contraindications to the Dix-Hallpike manoeuvre: a multidisciplinary review. Humphriss RL, Baguley DM, Sparkes V, Peerman SE, Moffat DA. *Int J Audiol*. 2003 Apr;42(3):166-73.
- Misdiagnosing Dizzy Patients. Kerber KA and Newman-Toker DE. *Neurology Clinics* 33 (2015) 565-575
- Post Epley restrictions: https://www.ncbi.nlm.nih.gov/pubmed/22513962