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- [PLAB 1 QUESTION BANK](#)
- [Reports Manager](#)
- [PLAB1-PLAB2 NOTES](#)
- [Administration](#)
- [Sign Out](#)

Resource view

Resource name	Neurology PLAB 1 Notes
Resource description	Neurology
Resource content	

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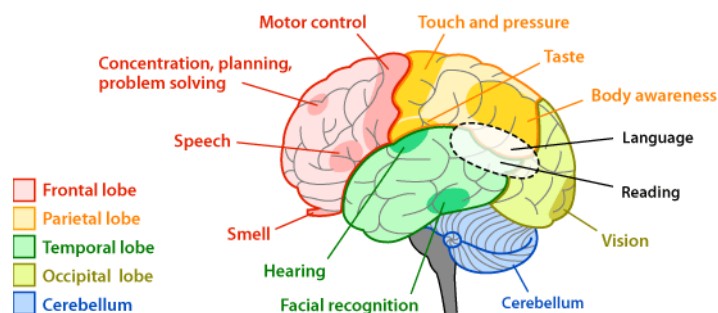
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Lecture notes: Neurology

The brain is comprised of the left and right hemisphere. Each hemisphere has four lobes.

Lobes

1. Frontal lobes
2. Temporal lobes
3. Parietal lobes
4. Occipital lobes



Left hemisphere:

- Is usually the dominant hemisphere
- 70% of all left handed people have the left hemisphere as dominant
- Almost all right handed people have the left hemisphere as dominant
- The dominant hemisphere contain areas of speech

Right hemisphere:

- Usually it is non-dominant, meaning no areas of speech

There are 2 areas of speech:

Broca's Area

- Broca's area is located in frontal lobe
- If affected, patient will have expressive aphasia (Broca's aphasia)
- Difficulty to find right words
- Speech is slow
- Comprehension is intact but Coherence is lost
- Writing and reading are impaired
- Difficulty in naming objects

Wernicke's Area

- Reading + writing relatively maintained
- Wernicke's area is located in the temporal and parietal region
- If affected, it causes Receptive Aphasia / Dysphasia
- Fast, fluent speech, full of empty words
- Comprehension is lost but coherence is maintained
- Difficulty in understanding
- Comprehension is lost, coherence is maintained

Dysphasia:

It is a disorder of speech. There are two types:

1. Nominal aphasia: difficulty in naming objects (Broca's aphasia)
2. Global aphasia: Broca's aphasia and Wernicke's aphasia where patient cannot understand and express himself.

Agraphia is:

Disorder of writing

Alexia is:

Disorder of reading

Dysarthria: (slurred speech)

Disorder of articulation e.g. in alcoholics or cerebellar problems due to loss of coordination of the muscles of the tongue

Dysphonia:

Disorder of speech volume e.g. vocal cord lesion(e.g. laryngitis), recurrent laryngeal nerve palsy

Dyspraxia:

Inability to do complex movements. There are different types:

1. Gait dyspraxia
2. Dressing dyspraxia
3. Constitutional dyspraxia (building)

Ataxia is:

Unsteadiness or lack of balance

Brain lesion

Effects of Lesion on the brain: A lesion can do 2 things to the brain

1. Causes destruction/compression on the brain: there will be focal neurological signs like weakness of the legs, visual symptoms, dysphasia sensory loss
2. Can cause irritation of the brain and cause functional problems like epilepsy or hallucinations and delusions.

Focal Neurological Signs:

1. Frontal lobe:

- Personality change
- Intellectual impairment
- Broca's aphasia (if dominant hemisphere)
- Mono or hemiparesis
- Urinary Incontinence

2. Temporal lobe:

- Memory loss (amnesia)
- Déjà vu (a feeling everything is familiar)
- Je'mais vu (failure to recognise situations which have been encountered before)
- Wernicke's aphasia if dominant hemisphere
- Upper quadrant anopia
- Agnosia (loss of perception)

3. Parietal lobe:

- Sensory loss
- Astereognosis (failure to recognise objects by touch)
- Loss of 2 point discrimination
- Wernicke's aphasia (if dominant hemisphere)
- Lower quadrant anopia

4. Occipital lobe:

- Homonymous hemianopia
- Cortical blindness due to bilateral occipital lobe infarction (patient is blind but does not understand that he is blind. He has no insight to his blindness)

5. Cerebellum (is mainly responsible for coordination):

- Diplopia
- Dizziness
- Nystagmus
- Dysarthria (slurred speech)
- Hypotonia
- Past pointing
- Dysdiadokinesis
- Heel-shin test positive
- Ataxia (cerebellar ataxia)

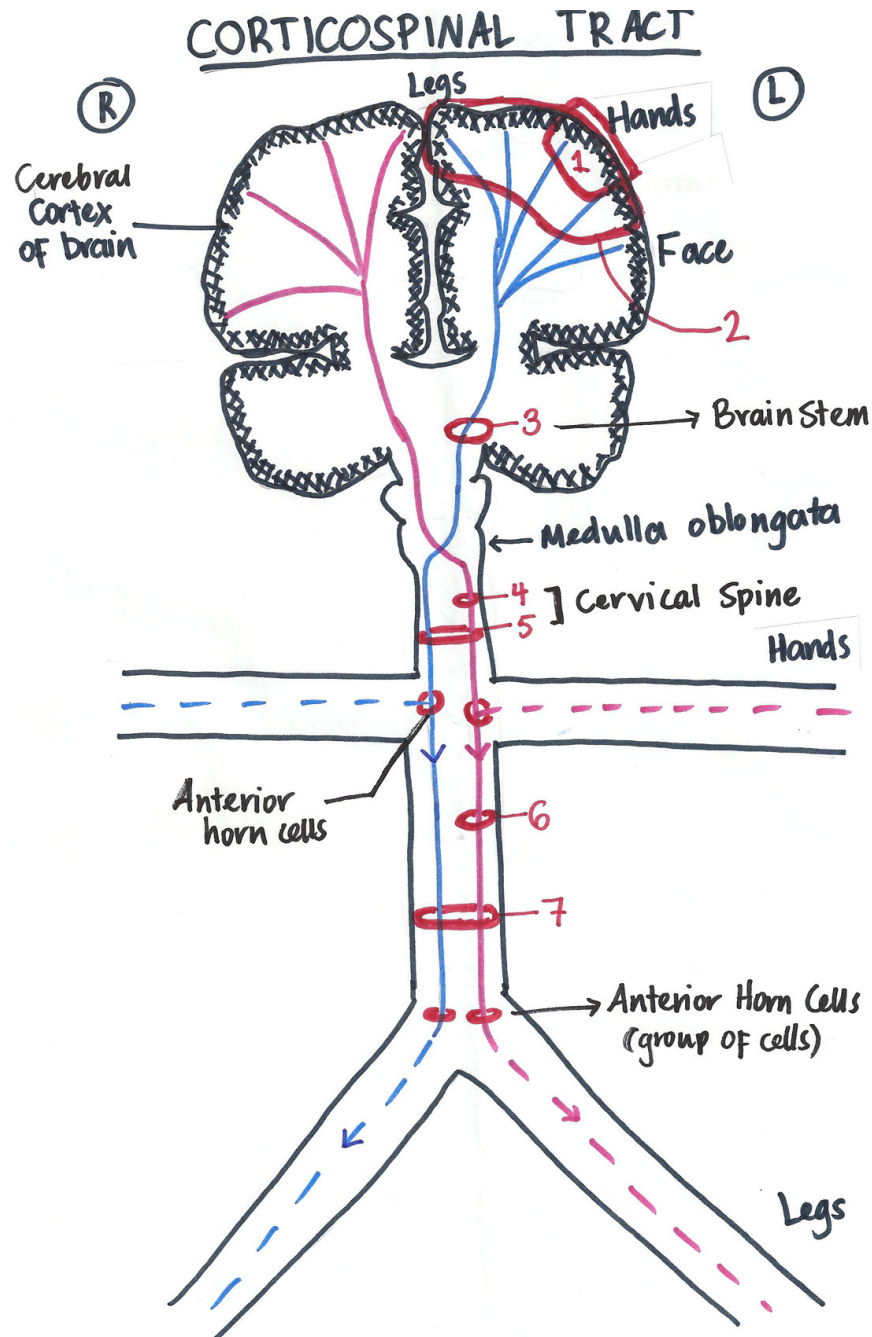
6. Cerebellopontine angle

- There will be cerebellar signs
- Cranial nerves V, VII and VIII are affected together, because they pass through the cerebellopontine angle e.g. acoustic neuroma ((schwanoma) tumour of the VIII nerve)

CORTICO-SPINAL TRACT (Pyramidal system - motor system):

Nerve fibres start in the cortex of the brain and end in the anterior horn cells of the spinal cord. The anterior horn cells are a group of nuclei.

Each part of the brain cortex is responsible for one part of body



1. Cortical Ischaemia - Contralateral monoparesis
2. Cortical Ischaemia - Contralateral hemiparesis
3. Brain stem - Contralateral hemiparesis (cranial nerves will be affected as well)
4. Cervical spine lesion - Ipsilateral hemiparesis
5. Cervical spine lesion - Tetraplegia or quadriplegia
6. Ipsilateral monoparesis – Left leg for example
7. Complete section of the spinal cord – paraplegia

Upper Motor Neuron signs (UMN): (lesion is above anterior horn cell)

1. Hyperreflexia
2. Hypertonia
3. Upgoing /extensor plantar reflexes (Babinski Sign)

Lower Motor Neuron signs (LMN): (lesion is on the anterior horn cell)

1. Hypotonia
2. Hyporeflexia
3. Flexor plantar
4. Muscle wasting
5. Muscle fasciculations

Motor Neurone Disease (MND):

This is damage to anterior horn cells and nuclei. Only the motor system is affected.

Symptoms:

1. Weakness in the limbs
2. Cranial nerve damage causing dysphagia and speech problems.

Common in middle aged men aged between 35-55 years.

Bulbar Palsy: (Cranial Nerves IX-XII)

LMN lesions of muscles of mastication, swallowing and talking

Signs:

1. Muscle fasciculations
2. Tongue fasciculations
3. Jaw jerk normal or absent
4. Speech is quiet
5. Donald duck speech (nasal speech)

Pseudobulbar palsy:

Lesion is above the mid-pons. UMN lesion of muscles of tongue, chewing, swallowing and facial muscles.

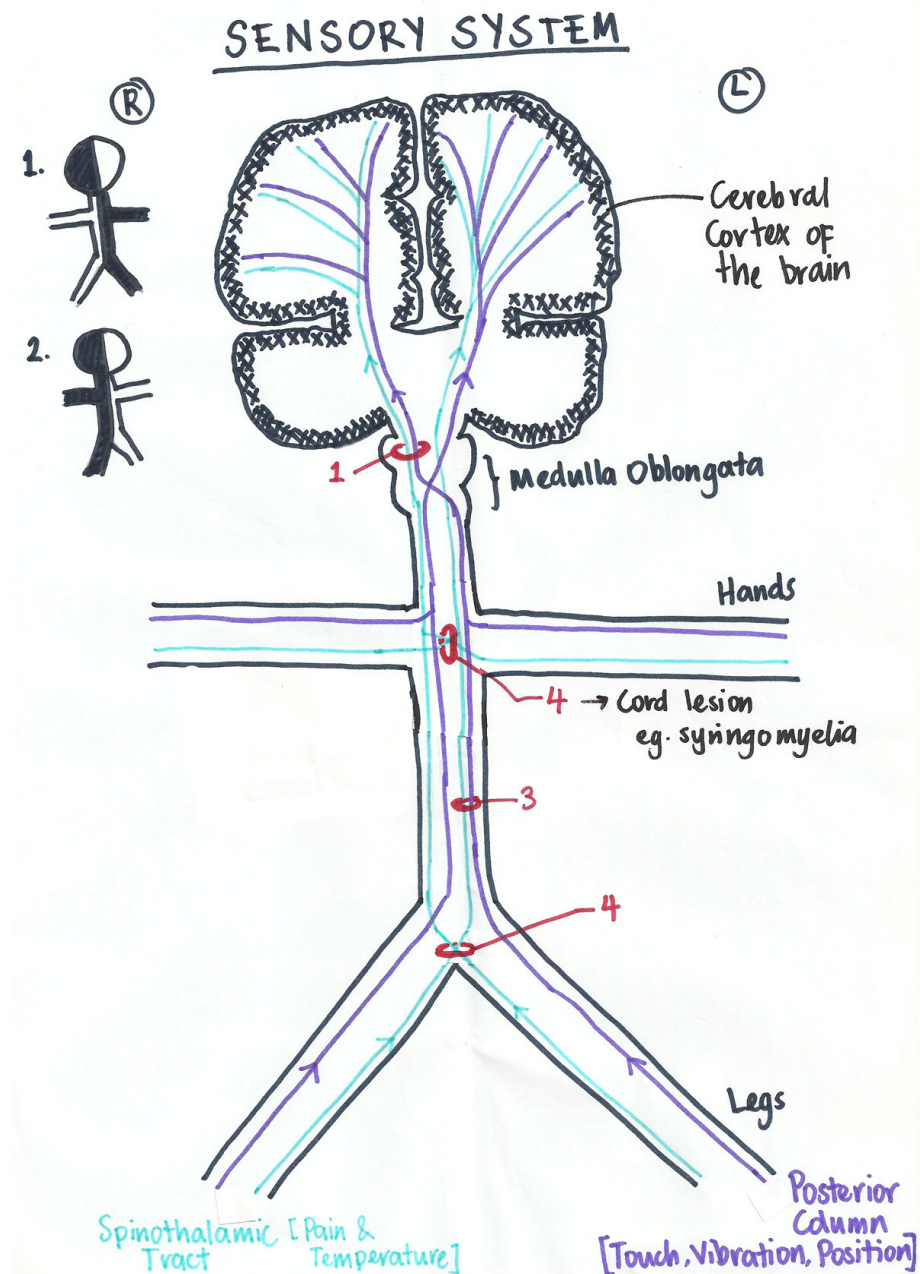
Signs:

1. Increased jaw jerk
2. Unprovoked sorrow
3. Mood incongruence

N.B: In MND there is:

- NO sensory loss only Motor loss
- NO sphincter disturbances
- Eye muscles are NOT affected, which differentiates it from myasthenia gravis.

SENSORY SYSTEM:



N.B: The posterior column carries the light touch, position and vibration. It enters the spinal cord and remains on the same side until the fibres reach the medulla oblongata where they cross to the opposite side.

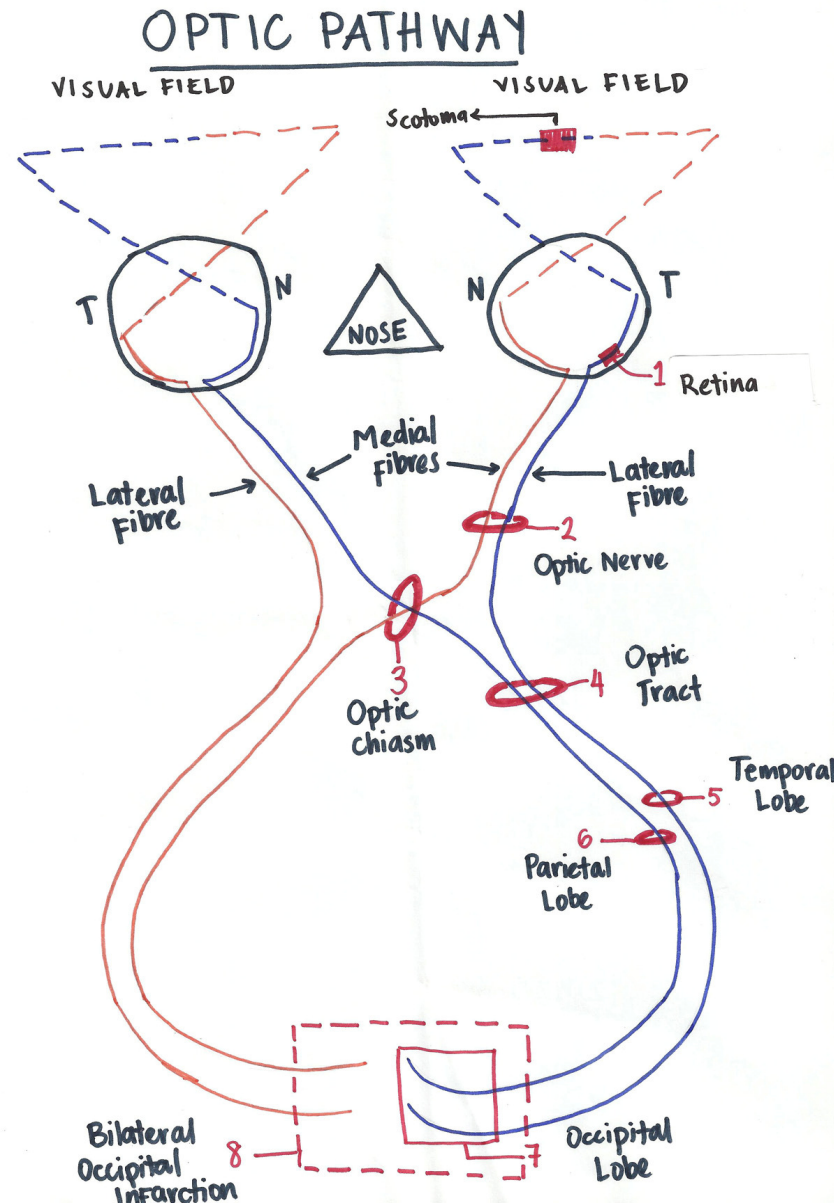
Spinothalamic tract carries the pain and temperature fibres. It crosses the spinal cord within the first 2 segments.

1. Lesion in the **brainstem** will cause sensory loss on the **same side** of the face and **contralateral** sensory loss in rest of the body below the face.

2. If the lesion in the **thalamus**, sensory loss occurs on the **same side** of the face as on the rest of the body.

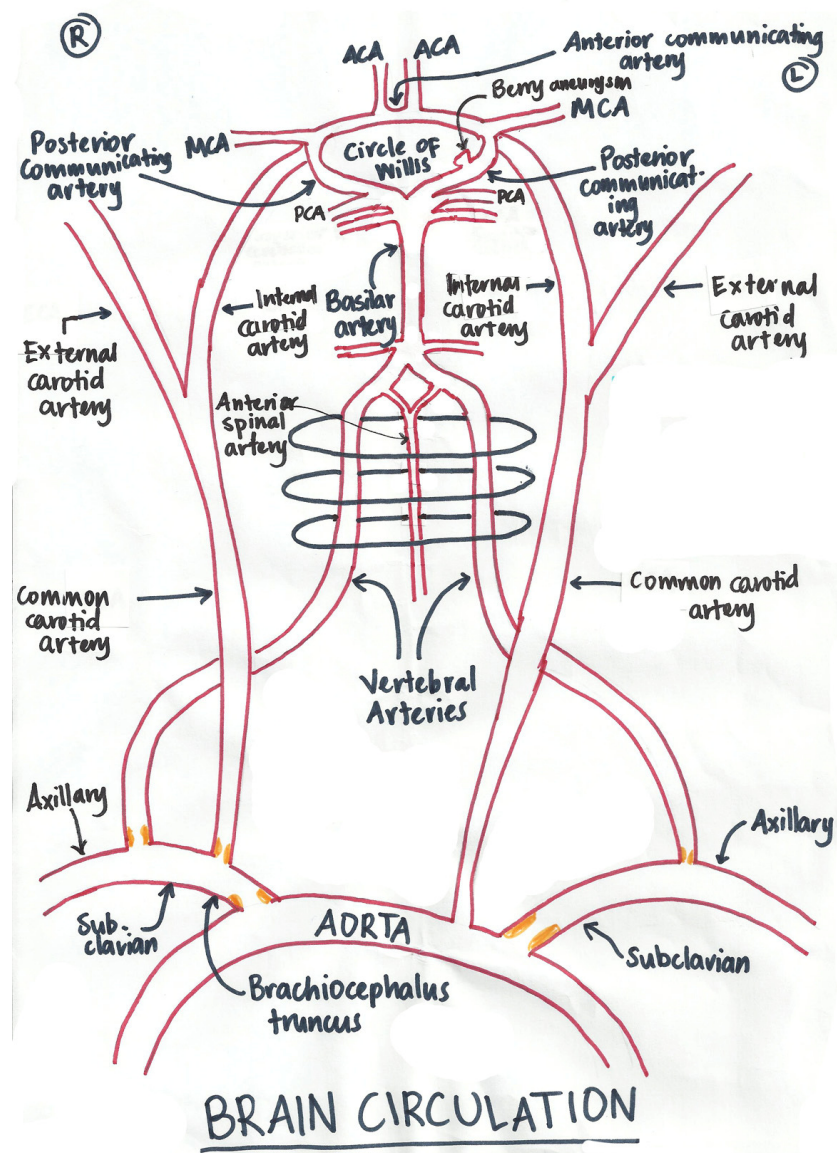
3. **Brown Sequard syndrome:** Hemi-section of the spinal cord will cause sensory loss on the **same side** due to damage in posterior column and loss of pain and temperature on the **contralateral** side due to damage of spinothalamic tract. Causes include trauma, tumours etc.

4. **Cord lesion** will cause loss of pain and temperature only and usually in a segmental pattern. Common cause of cord lesion is syringomyelia.

II CRANIAL NERVE: Optic nerve

NB: The optic nerve consists of medial and lateral fibres. The media fibres cross and the lateral fibres remain on their side.

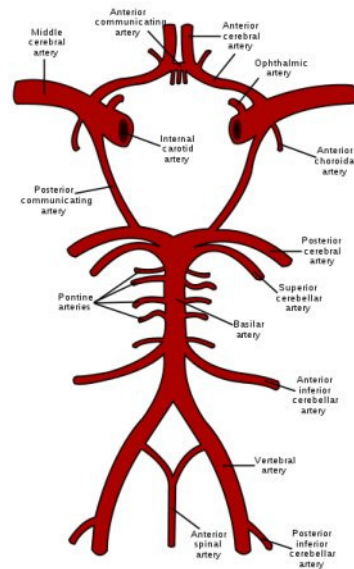
1. Lesion on the **retina**: causes include retinal detachment or haemorrhage. A lesion will cause scotoma. A scotoma is a small area in the patient's vision where he/she cannot see.
2. Lesion on the **optic nerve**: common cause is multiple sclerosis, which causes optic neuritis. Symptoms include sudden loss of vision in one eye and there is usually dull pain when moving the eye. It will cause monocular blindness.
3. Lesion on the **optic chiasma**: common cause is pituitary tumour, which compresses the optic chiasma. Other causes include craniopharyngioma and meningioma. Visual field defect is bitemporal hemianopia.
4. Lesion on the **optic tract**: common causes include stroke and tumour. Visual field defect is non-congruous homonymous hemianopia. The visual field defect is always on the opposite side to where the lesion is.
5. Lesion in the **temporal lobe**: causes include stroke and tumour. Visual defect is homonymous upper quadrantanopia. The visual field defect is always on the opposite side to where the lesion is.
6. Lesion in the **parietal lobe**: causes include stroke and tumour. Visual field defect is homonymous lower quadrantanopia.
7. Lesion on the **occipital lobe**: causes include stroke and tumour. Visual field defect is congruous homonymous hemianopia. Can be with macula sparing or non-macula sparing. If it is macula sparing then the cause is posterior cerebral artery. The visual field defect is always on the opposite side to where the lesion is.
8. **Bilateral lobe lesion** e.g. bilateral stroke causing cortical blindness.

BLOOD SUPPLY OF THE BRAIN:

ACA = Anterior cerebral artery

MCA = Middle cerebral artery

PCA = Posterior Cerebral Artery



A. Vertebro-basilar artery supplies:

1. Posterior Cerebral Artery which supplies the occipital lobe
2. Cerebellum
3. Brainstem

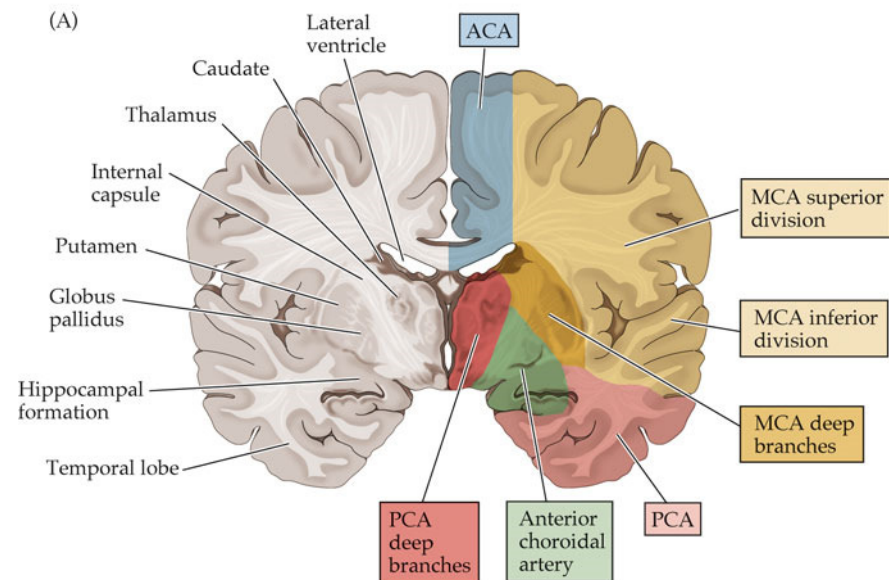
(Vertebro-basilar insufficiency/atherosclerosis)

B. Internal Carotid artery supplies:

1. Anterior Cerebral Artery which supplies the frontal lobe and inner aspect of the hemisphere
2. Middle Cerebral Artery which supplies the outer aspect of the hemisphere

(Carotid artery disease)

C. External Carotid: supplies the eye. It causes amaurosis fugax.



Areas of the brain supplied by the cerebral arteries.

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Vertebro-basilar Atherosclerosis:

Causes hypoperfusion of the cerebellum leading to the following symptoms:

1. Dysarthria
2. Diplopia
3. Nystagmus

4. Hypotonia
5. Ataxia
6. Finger nose past-pointing
7. Dysdiadokinesia
8. Vertigo

Atherosclerosis of the **posterior-inferior cerebellar artery or vertebral artery** causes lateral medullary syndrome which is ischaemia to the brain stem and cerebellum leading to Horner's syndrome and cerebellar signs.

Horner's Syndrome:

1. Ptosis (incomplete)
2. Miosis
3. Enophthalmus
4. Anhydrosis (loss of sweating on the ipsilateral side of the face)
This is due to damage to sympathetic fibers

Subclavian Steal Syndrome

Subclavian artery stenosis proximal to the vertebral artery, causing blood to be 'stolen' down the axillary artery down the arm, leading to brain ischaemia.

Suspected if you have a different blood pressure in each arm, usually >20mmHg.

N.B: Thoracic aortic aneurysm will cause different blood pressure in each arm as well.

DEMENTIA:

Main feature is memory loss. Impaired cognition with intact consciousness causes:

1. **Alzheimer's Disease:**

- Commonest cause of dementia in the UK
- Gradual onset
- Visuo-spatial dysfunction e.g. getting lost when taking a walk in the park or when driving.
- Progressive memory loss and cognition
- Normally in old age
- Pathologically: **Neurofibrillary tangles and senile plaques**
- Patient may be previously fit and well
- There are behaviour changes: aggressive, emotionally liable, depression
- May have seizures in the late phase.

Investigations: Rule out the following reversible causes (dementia screen)

- a. B12/Folate deficiency
- b. TSH (hypothyroidism)
- c. HIV test
- d. Thiamine deficiency
- e. Syphilis serology

CT scan: to rule out vascular dementia, subdural haematoma or brain tumour.

Diagnosis is made by mini-mental state examination or mental state examination

Treatment: Donepezil

2. **Vascular Dementia/ Mult-infarct Dementia:**

- Second commonest cause of dementia in the UK
- Sudden onset
- Due to multiple TIA's or Stroke
- History of hypertension or diabetes mellitus
- History of ischemic heart disease
- History of atherosclerosis (intermittent claudication)
- There is **STEPWISE DETERIORATION** in cognition and memory

Investigation: CT scan brain (which will show brain infarction)

3. Fronto-temporal lobe Dementia:

- Early personality change
- Visual spatial functions are relatively preserved from the beginning
- Early intellectual impairment

4. Lewy Body Dementia:

- Hallmark of Lewy Body dementia is **FLUCTUATING** loss of memory
- It is associated with Parkinsonism (bradykinesia, tremors, rigidity)
- Pathological finding = Lewy Bodies

5. Huntington's Disease:

- There is a strong family history
- It is autosomal dominant (1:2 inheritance)
- Usually in a young or middle aged patient
- Chorea

6. Pseudo-dementia:

- Due to depression
- Symptoms of depression like low mood, poor sleep, loss of appetite, loss of interest in daily activities
- Responds to antidepressants

7. Pick's Dementia:

- Mainly cognition impaired
- Memory is usually normal (they score very well on the memory test)
- Unusual sexual adventures and talking about their sexual life openly
- It may lead to stealing

1. Wilson's Disease:

- This is accumulation of copper in different organs due to deficiency of a protein called ceruloplasmin which transports copper in the body
- Copper accumulates in different organs of the body:
 - a. Copper deposition in the brain leads to dementia
 - b. Copper deposition in the liver leads to liver disease
 - c. Copper deposition in the joints leads to joint pain
 - d. Copper deposition in the eye will cause Kaiser Fischer rings
- Investigation: Serum copper

1. Wernicke's Korsakov Syndrome:

- This is brain damage due to deficiency of Vitamin B1, also called thiamine
- It is common in alcoholics
- The patient always has liver disease
- Consists of Wernicke's encephalopathy: which is a triad of confusion, ataxia and ophthalmoplegia. Patient will also have flapping tremor and headache.
- Korsakov's Psychosis: confabulation due to short-term memory loss. Confabulation is making up stories due to short-term memory loss.
- Treatment: Thiamine

11. Creutzfeldt-Jacob Disease (Prion Disease/Mad Cow Disease):

- Prion is an altered protein which can be transmitted through blood transfusion or surgical instruments from one patient to another
- It can transform other proteins to become abnormal therefore it is infective
- Common in haemophiliacs with history of previous blood transfusion
- Accumulation of these prions in the brain causes dementia
- No treatment available

1. HIV dementia:

- Must be an HIV patient

- History of blood transfusion or IVDU or homosexuals
- HIV patients are usually immune-compromised and usually also they have tuberculosis
- Dementia present with confusion but this is progressive confusion for weeks and months

1. **Age-related forgetfulness:**

- Patient has insight to problem
- It is normal forgetfulness which everyone develops with age
- The patient is usually concerned and not happy about it

N.B: Patients with true dementia have no insight in to the problem.

Cranial Nerves

- i. **Olfactory:** if it is affected patient will have anosmia (loss of sense of smell)
- i. **Optic nerve:** please see above
- i. **Oculomotor:** Damage to this nerve will cause diplopia in different directions. There is also dilated pupil and complete ptosis. Diplopia on looking up means third nerve palsy but it can cause diplopia in other directions as well as it innervates 4 muscles of the eye:

1. Superior Rectus
2. Inferior Rectus
3. Medial rectus
4. Inferior oblique

The eye deviates downwards and outwards.

- i. **Trochlear:** Diplopia on looking down i.e. walking down the stairs or reading. But dilated pupils will mean 3rd nerve palsy and 4th nerve palsy does not cause dilated pupils. The 4th nerve innervates the superior oblique (SO4), which pulls the eye down and medially.
- i. **Trigeminal nerve:** Sensory loss on face of ophthalmic, maxillary or mandibular division i.e. loss of sensation on the face. It innervates the involuntary muscles and muscles of mastication (masseter muscles and temporalis). It also innervates the cornea, so can cause corneal anaesthesia or loss of the corneal reflex and jaw jerk reflex.
- i. Trigeminal Neuralgia is electric, stabbing, knife like, shooting pain on the face. Treatment: carbamazepine.
- i. **Abducent nerve:** It innervates the lateral rectus muscles (LR6) and if it is affected there will be diplopia on looking sideways. Dilated pupils would indicate 3rd nerve palsy.
- i. **Facial nerve:** Failure to close the eye, loss of nasio-labial folding, deviation/dropping of angle of mouth, loss of taste in anterior 2/3rd of the tongue.
 - i. *Lower motor lesion- Both face and forehead are affected*
 - ii. *Upper motor lesion- Forehead is spared (not affected)*

N.B: It innervates the voluntary muscles of the face (muscles of expression)

- i. **Vestibulocochlear nerve:** Damage will cause deafness and balance problems (sensory ataxia – dizziness and vertigo). It has connection with the posterior column.
- i. **Glossopharyngeal:** Innervates Tongue and Pharynx
 - i. Loss of taste on Post 1/3rd of tongue
 - ii. Deviation of palate to one side
- i. **Vagus:** Loss of gag reflex plus it innervates a lot of visceral organs including the heart.
- i. **Accessory nerve:** There will be failure to shrug shoulders on resistance because it innervates trapezius and also failure to turn head sideways on resistance because it innervates sternocleidomastoid muscle (SCM).
- i. **Hypoglossal nerve:** Deviation of tongue one side. The lesion is on the same side where tongue deviates

MENINGITIS:

Inflammation of the meninges of the brain

Causes:

- a. Bacterial
 - 1. Streptococcal pneumonia is the commonest in adult
 - 2. Neisseria meningitides usually if there is rash
 - 3. Tuberculosis in patients from endemic areas like Africa and Asia
 - 4. Listeria monocytogenes should be considered if more than 50 years of age
- a. Viral
- b. Protozoa
- c. Leukaemic Infiltration if there is history of leukaemia
- d. Malaria in patients with recent history of travel to endemic areas like Africa

Symptoms:

- 1. Headache
- 2. Fever
- 3. Photophobia
- 4. Vomiting
- 5. Rash - suggests meningococemia and the cause is Neisseria meningitides



Signs:

- 1. Brudzinkin's Signs
- 2. Kernig's Sign
- 3. Neck Stiffness
- 4. photobia

Management of Meningitis

- 1. If you suspect meningitis and you are outside the hospital (commonly in the GP) you should give 2.4 g intravenous benzylpenicillin and the patient should then be sent to hospital
- 1. In hospital give intravenous third generation cephalosporin antibiotics (ceftriaxone or cefotaxime)
- 1. Now look for rash. If patient has got rash then do blood culture as the diagnosis is meningococcal septicaemia. The causative organism is Neisseria meningitides.
- 1. If no rash then we need to do a lumbar puncture, but check that there are no signs of raised intracranial pressure (drowsiness, papilloedema, focal neurological signs); Headache and vomiting are not very reliable signs of raised ICP in meningitis as most of the time meningitis presents with vomiting and headache.

1. If there are signs of raised intracranial pressure then do CT scan of the head in order to rule out raised ICP. If CT proves there is raised ICP do not do lumbar puncture as there is risk of herniation of the brain.
1. If there are no signs of raised ICP then do lumbar puncture straight away.

If patient more than 50 years of age add cotrimoxazole to cover listeria, but if listeria has been identified then give ampicillin/amoxicillin and gentamicin.

Key Points of Management:

1. GPs should give benzylpenicillin or a 3rd generation cephalosporin (cefotaxime and ceftriaxone) before urgent transfer to hospital.
2. Give chloramphenicol if there is a history of anaphylaxis to penicillin or cephalosporins.
3. **Meningococci:** Benzylpenicillin or 3rd generation cephalosporin for at least 5 days.
4. **Pneumococci:** 3rd generation cephalosporin or benzylpenicillin for 10-14 days. If resistant, add vancomycin.
5. **Haemophilus Influenza:** 3rd generation cephalosporin for 10 days.
6. **Listeria:** Amoxicillin and gentamycin

Signs of raised ICP in general

1. Papilloedema
2. Drowsiness
3. Headache
4. Vomiting

Lumbar Puncture

	VIRAL	T.B.	Bacterial
Cells	Lymphocytes	Lymphocytes	Neutrophils and Polymorphs
Glucose	←→ or Slightly↓	↓	↓
Proteins	↑	↑	↑

Normal CSF:

- Glucose is 2.5 - 4.5 mmol/L (1/2 – 2/3 of blood glucose)
- Protein 0.2 - 0.5g/L (200-500mg/dl)

Prophylaxis of Meningitis

Rifampicin BD (twice daily) for 2 days for all contacts including doctor and nurse e.g. nursery, classrooms.

NB: prophylactic antibiotics are given only to people who have come in contact with a patient or those who are more likely to have been in contact.

Complications of meningitis:

1. Deafness (especially in children – 10% of child cases) - arrange hearing test after treatment of meningitis in children.
2. Failure to thrive in children.
3. SIADH - causes low sodium. Treat with fluid restriction.
4. Raised ICP - treat with mannitol and monitoring.
5. Seizures - treat with lorazepam and then phenytoin or treat as status epilepticus.
6. The majority of patients do not develop complications.

CNS infection in HIV:

Toxoplasmosis Gondii

Presents with mass like effect i.e. progressive headache and focal neurological signs

Investigation is CT scan which shows ring enhancing lesion

If signs of raised intracranial pressure give dexamethasone

Treatment is pyrimethamine and sulphadiazine

Cryptococcus Meningitis

Presents with altered consciousness or confusion with meningism and headache

Investigation is Lumbar Puncture for CSF

Treatment is amphotericin in acute state and fluconazole for maintenance

Parkinson's Disease

The hallmark of Parkinson's disease is presence of lewy bodies and neural cell death in the pars campus in the substantial nigra.

Parkinson disease does not develop until the level of dopamine falls below 20% of normal amount.

Symptoms:

1. Mask like face
2. Shuffling gait
3. Bradykinesia: slowness of initiation of movement
4. Rigidity
5. Tremor (unilateral)

Symptoms are usually unilateral and there is good response to levodopa.

Symptoms are progressive

Investigation: no diagnostic test. Diagnosis is made by clinical symptoms.

Treatment:

1. Levodopa
2. Dopamine agonist cabergoline, ropirinoles,
3. Apomorphine
4. Amantidine
5. MAOI like selegiline
6. Entacapone a COMT drug
7. anticholinergic agent like benhexol

Differential Diagnosis:

1. Lewy Body Dementia – does not respond very well to levodopa. Parkinson's disease does respond well to levodopa.
2. Drug induced Parkinsonism – Typical antipsychotics (haloperidol)

EPILEPSY (Abnormal electrical discharge in the brain)

CLASSIFICATION:

1. Partial
2. Primary Generalised

PARTIAL:

this is when electrical discharge from 1 hemisphere

- a. Focal (remains in 1 hemisphere)
- b. Secondary Generalised (spreads to both hemispheres) e.g. Jacksonian attack (jerking starts from the thumb -> hands -> body).

PRIMARY GENERALISED:

Electrical discharge from both hemispheres

- a. Infantile spasms (salaam attack) common in infants. This child jerks back and forth like the way muslims pray. It can also cause severe developmental delay
- b. Absent seizures -> in children. A period the child stops for about 10 seconds and then resumes what he is doing
- c. Tonic clonic
- d. Atonic (floppy)
- e. Myoclonic (twitching of the muscles of the face and the whole body)

Epilepsy:

- 1. Simple (no loss of consciousness)
- 2. Complex (loss of consciousness)

Symptoms:

- 1. Jerking (fit)
- 2. Urinary or faecal incontinence
- 3. Tongue biting
- 4. Loss of consciousness
- 5. Post-ictal status

Investigations:

- 1. EEG: Investigation of choice is EEG
- 2. CT Scan (to rule out brain tumour)
 - a. If seizure of new onset at night (during sleep)
 - b. If seizure is associated with prolonged headaches
 - c. New onset focal seizures in adults (epilepsy is usually develops in a child)

Treatment:

- 1. Primary Generalised epilepsy - Sodium valproate
- 2. Absence seizure - Ethosuximide
- 3. Partial seizure - Carbamazepine
- 4. Infantile Spasm - Vigabatrin

If seizures without any cause -> send to 1st fit clinic and advise the patient not to drive and inform DVLA.

General advice to give patient:

- 1. Do not drive and advise patient to inform DVLA
- 2. Avoid unsafe activities e.g. swimming alone, mountain climbing, riding a bicycle
- 3. Take showers rather than bath
- 4. Avoid precipitants like night club, watching TV with strobe lights on

Status Epilepticus:

This is seizure lasting more than 30 minutes or repeated attacks of seizures without gaining consciousness in between.

Treatment of Status Epilepticus:

IV lorazepam
↓
IV lorazepam
(repeat)
↓
Phenytoin IV
↓

Phenobarbiturate IV



Anaesthetise and Intubate

If after PR Diazepam if patient is still fitting and you have gained an intravenous line give IV Lorazepam

Drug Side Effects

1. Carbamazepine: Rash (in short term), Renal failure, diplopia, hyponatraemia, SIADH, neutropenia
1. Sodium Valproate: weight gain, liver failure, tremor, sedation, rash, low platelets, hair loss
1. Phenytoin: gum hypertrophy, cerebellar signs and depression.
 - ↓
 - i. Nystagmus
 - ii. Diplopia
 - iii. Ataxia
 - iv. Dysarthria
 - v. Dizziness
1. Ethosuximide: bone marrow suppression, headache, lethargy, ataxia, agranulocytosis, GIT irritation.
1. Benzodiazepines: IM injection may cause cold abscess

INTRACRANIAL BLEED:**1. Subarachnoid Haemorrhage:**

- Common in young patients 30-50 years
- Cause is Berry aneurysm - located at posterior or anterior communication artery.
- May present with collapse while exercising
- It is associated with Polycystic Kidney Disease, coarctation of aorta, Ehler-Danlos syndrome.

Signs and symptoms

1. Sudden onset headache at the back of the head (occipital)
2. Projectile vomiting
3. Neck stiffness
4. Photophobia
5. There is usually family history

N.B: Sudden onset of headache is always subarachnoid haemorrhage until proven otherwise. Severe headache but no history of head injury.

Investigation:

1. CT scan head
2. If CT scan head does not show bleeding, do lumbar puncture at least 12 hours after onset of headache. Usually you look for bilirubin in the CSF (xanthochromia).

Treatment:

1. Nimodipine for the pain
2. Refer to neurosurgeon
3. Treatment is usually surgery (clipping of the aneurysm)

2. Subdural Haematoma:

- Common in elderly with recurrent falls
- Also in alcoholics and boxers due to recurrent head injury
- changing level of consciousness (progressive drowsiness)
- Trauma may happen long time and patient may forget about it e.g. 2 weeks ago
- Signs of raised ICP which are headache, papilloedema and vomiting
- Focal neurological signs i.e. weakness of the legs or sensory loss
- Can present with cognitive impairment

Investigation: CT scan

Treatment:

1. Refer to neurosurgeon for evacuation of haematoma
2. Surgery - Burr hole (done as an emergency to relieve increased intracranial pressure)

3. Extradural Haematoma:

- Rapid deterioration of consciousness
- There is lucid interval i.e. in minutes to hours
- Almost/always there is history of head injury
- Signs of raised ICP (headache, vomiting and papilloedema)
- Fits
- Focal neurological signs
- Up going plantar reflexes (Babinski sign)
- Monoparesis

Investigation: CT scan

Treatment: 1. Surgery for evacuation of haematoma
2. Burr hole may be used in emergency to relieve the pressure

4. Intracerebral bleeding (haemorrhagic stroke)

- Elderly patient with history of hypertension, usually uncontrolled or untreated hypertension.
- Sudden loss of consciousness, preceded by headache
- History of ischaemic heart disease or diabetes mellitus
- Normally focal neurological signs
- Up going plantar reflex
- Dilated pupils
- UMN signs in limbs
- Intracerebral bleed is same as haemorrhagic stroke

Investigation: CT scan head.

Treatment: Refer to neurosurgeon to evacuate haematoma

Differential Diagnosis for Focal Neurological Signs:

Focal neurological signs are impairments of nerve or brain function that affects a specific region of the body. For example: weakness of the arm, or the leg etc.

Differential diagnosis:

1. Intracranial bleeding
2. Meningitis
3. Multiple Sclerosis
4. Brain or spinal tumour
5. Syringomyelia
6. Trauma
7. Migraine
8. Stroke
9. Motor Neurone Disease
10. Myasthenia Gravis

FOCAL NEUROLOGICAL SIGNS:

1. Multiple sclerosis: Autoimmune condition. It is due to demyelination of the nerve fibres in the central nervous system (brain and spinal cord). It only affects CNS not peripheral nervous system. Patients are usually young females, typical age 18-30 years old.

There is mono-symptomatic presentation depending on the location of the lesion and lesions are scattered in neuro-anatomy.

- a. **Optic Nerve** - Optic neuritis, sudden loss of vision with dull pain in the eye, then symptoms will resolve and then come back
- b. **Spinal Cord** - Weakness in the limbs, urinary retention/incontinence
- c. **Optic Disc** - Papilloedema

- d. **Brainstem** - Weakness in the leg or sensory loss with cranial nerves palsy.
- e. **Cerebellum** - Dysarthria, nystagmus, ataxia, etc.

Symptoms appear on by one and each time the lesion is in a different location.

Classification:

1. Remitting/Relapsing MS: symptoms comes and go (symptoms stay for weeks-months, then disappear completely). This is commonest form
2. Primary Progressive MS: from the beginning the symptoms keep progressing without remission.
3. Secondary Progressive MS: Initially it was remitting/relapsing MS then symptoms started progressing.

Investigation:

- a. MRI scan of the brain or spinal cord depending on the symptoms. This is the investigation of choice
- a. Lumbar Puncture - look for monoclonal bands in CSF

Diagnosis is made by MRI and clinical signs

Treatment:

During attack ↓ IV Methylprednisolone	During remission ↓ Interferon α + β (disease modifying drugs)
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CEREBROVASCULAR ACCIDENT:

Consists of stroke and transient ischaemic attack (TIA). The cause for both are the same.

Brain ischemia: results in brain infarct

Causes:

1. Thrombosis
2. Emboli
3. Thromboembolism
4. Haemorrhage

Patients are elderly with sudden onset of symptoms.

Cardiovascular Accident

1. **Stroke:** symptoms >24 hours
2. **TIA:** symptoms <24 hours

STROKE:

1. Ischaemic
2. Haemorrhagic -> intracerebral haemorrhage (associated with increased blood pressure, uncontrolled or untreated hypertension)

Symptoms:

1. Carotid atherosclerosis or carotid artery disease:
 - a. Frontal lobe - hemiparesis, monoparesis, dysphasia if dominant
 - b. Temporal lobe - memory loss
 - c. Parietal lobe - sensory loss
 - d. Eye - amaurosis fugax
 - e. If dominant hemisphere aphasia/dysphasia
2. Vertebrobasilar atherosclerosis or vertebrobasilar insufficiency:

- a. Dysarthria
 - b. Vertigo
 - c. Nystagmus
 - d. Cerebellar ataxia
 - e. Hypotonia
3. Brainstem: Cranial nerves are involved and causes difficulty swallowing
(UMN sign lesions in limbs)

A. Investigations to find the cause:

- If Atrial Fibrillation then Echocardiogram to see intra-cardiac emboli
- If recurrent Myocardial Infarction then Echocardiogram to see mural thrombi
- If Carotid bruit then Doppler ultrasound of the neck
- If history of ischaemic heart disease, it means atherosclerosis is present then Doppler ultrasound (carotid artery and vertebrobasilar artery) needs to be done
- If diabetic patient then Blood glucose
- Blood pressure measurement to rule out Hypertension
- Heart murmur it means there is valvular heart disease which can cause emboli Echocardiogram to see an emboli
- Thoracic Aortic Aneurysm then CT scan chest

B. Investigation to make diagnosis:

CT Scan of head

1. Ischaemic
2. Haemorrhagic

General Management of cerebral vascular accident

- If patient has symptoms of stroke do CT scan head to exclude haemorrhagic stroke.
- If no haemorrhagic stroke then give Aspirin 300mg stat
- If patient presents within 3 hours and no haemorrhagic stroke, arrange thrombolysis.
- If patient had symptoms of stroke, which have now resolved it means he had TIA - give aspirin 300mg orally, even before doing a CT scan because symptoms have resolved which suggests it is TIA.

Prophylaxis: Aspirin + dipyridamole

If aspirin allergy substitute with clopidogrel

SPACE OCCUPYING LESION:

Causes:

1. Tumour
2. Abscess
3. Haematoma
4. Brain metastasis
5. Aneurysm
6. Granuloma

Symptoms:

- Usually in elderly patients
- Weight loss, anorexia
- Anaemia, tiredness
- Increased ICP: headache, vomiting and papilloedema
- Focal neurological signs (weakness in the limbs)
- Seizures

Investigations: CT scan head

BRAIN TUMOUR:

- Usually in elderly patients
- Symptoms are usually gradual onset
- Progressive worsening headache usually bilateral
- Adult onset seizure is always brain tumour until proven otherwise
- Headaches worse in the morning and on bending forward due to raised intracranial pressure

Treatment: 1. Dexamethasone if headaches or raised ICP to reduce oedema around tumour
 2. surgery if localised tumour
 3. Radiotherapy if metastasis but appropriate in that patient

MIGRAINE

- Young, female patient typically
- Recurrent headaches: throbbing, pulsatile, unilateral
- Associated with nausea and vomiting
- Aura – can be sensory or visual
 - a. Sensory aura usually tingling or numbness in upper limb
 - b. Visual aura usually patient sees zig-zag lines but it can be any other form of visual loss)
- Aura usually lasts seconds to minutes and within 1 hour of aura headache follows
- there is usually family history

Investigations: routine investigations, if diagnosis is not clear, to rule out other causes

Treatment: ACUTE = high dose aspirin 900mg or ketoprofen

Prophylaxis:

1. Beta-Blocker (Propranolol)
2. Topiramate
3. Amitryptalline

MYASTHENIA GRAVIS

It is due to reduction in the number of nicotine AChR at neuromuscular junction.

This is due to acetylcholine receptor antibodies formed against the acetylcholine receptor.

There is abnormality of the thymus gland in 75% of the cases either in a form of hyperplasia or thymoma.

It is an autoimmune condition.

It is associated with other autoimmune conditions like SLE, Pernicious Anaemia, Grave's disease, Rheumatoid Arthritis

Symptoms:

1. Painless muscle weakness which increases with exercise
2. Generalised weakness
3. Dysphagia, dysphonia, dysarthria, limb weakness
4. There is fatigability and weakness which worsens by the end of the day or whenever patient works hard.
5. Eye muscle weakness may present with diplopia

Investigation:

1. Serum AChR antibodies are diagnostic of myasthenia gravis
2. Tensilon (edrophonium) test diagnostic
3. CT mediastinum to look for thymus gland

Treatment:

1. Cholinesterase inhibitor e.g. Pyridostigmine
2. Steroid can be used if symptoms not adequately controlled by cholinesterase inhibitors
3. Azathioprine if steroid is contraindicated
4. Other immune suppressant e.g. ciclosporin, methotrexate may also be used
5. Plasma exchange and immunoglobulin are used in patients with myasthenia crisis.
6. Thymomectomy may be used in patients with AChR antibodies and under 45 years of age.

BENIGN POSITIONAL VERTIGO

This is characterized by recurrent episodes of dizziness provoked by quick change in position.

Precipitating factors: Trauma and viral illness.

This is a mechanical disorder due to movement of debris within the endolymph to the most dependent part of the canal during head movement.

Typical symptoms are vertigo on turning over in bed, lying down or sitting up from supine position.

Investigation: Dix - Hallpike manoeuvre

Treatment: Epiley manoeuvre

Peripheral versus Central Nystagmus

Peripheral Nystagmus:

- Has fixed direction
- Last less than 60 second
- There is fatiguability i.e. lessing of symptoms with repetition
- Severe vertigo with nystagmus
- Inconsistent when trying to reproduce it

Central Nystagmus:

- Consistent when trying to reproduce it
- Mild symptoms
- Marked nystagmus
- No fatiguability
- Symptoms are constant

HEADACHES

1. CLUSTER HEADACHE:

- Common in young middle aged men
- Usually unilateral severe headache, which radiates to the forehead
- Associated with redness of the eye and lacrimation.
- Severe headache which makes patient cry
- Headache occurs in clusters (comes and goes in periods e.g. 2 months of headaches at the same time and then 8 months of free headache and followed up by another period of headaches) this is why it is called cluster headache
- **Treatment is with high 100% oxygen and sumatriptan.**

1. GIANT CELL ARTERITIS:

- Typical age above 50 or elderly patients
- Common in women
- Unilateral headache on the temple areas
- Headache worse with combing hair, chewing (jaw claudication)
- Usually associated with weight loss, anorexia and weakness of the upper limbs
- In 25% it is associated with polymyalgia rheumatic which is an autoimmune condition mainly affecting the muscles especially those of the upper limb which make patient difficulty to stand up from the chair.

Investigation:

1. Initial is ESR
2. Definitive is temporal artery biopsy

Management:

If symptoms of GCA and ESR is raised then next step is treatment with IV methylprednisolone for 3 days followed by high dose oral prednisolone for 2 - 3 years i.e. long term.

Definitive diagnosis of GCA is made by temporal artery biopsy within 3 days of provisional diagnosis.

1. **TRIGEMINAL NEURALGIA:**

- Usually electric shock like or knife like or stabbing pain in the face
- Usually in the distribution of the trigeminal nerve branch e.g. mandibular, maxillary or ophthalmic
- Pain can be triggered by shaving or chewing
- Facial pain runs up and down the face

Treatment: Anti-epileptic medication e.g. Carbamazepine, gabapentin

1. **MIGRAINE:**

- Common in young women.
- Unilateral pulsatile or throbbing headache
- Usually preceded by visual or sensory aura
- Visual auras commonly are simply visual fortification or zig zag
- Sensory aura usually tingling and numbness in the hands
- Auras are followed by headache within 1 hour
- Headache usually associated with nausea and vomiting

1. **ACUTE CLOSED ANGLE GLAUCOMA:**

- Typically pain is in the eye with redness and lacrimation
- Usually associated with nausea, vomiting and loss of vision
- Unilateral headache
- Severe ocular pain
- Previous intermittent headache
- Usually there is family history
- Common in females
- Haloes around the light
- On examination there is corneal oedema (fine ground glass) and fixed dilated pupil oval shaped
- Raised intraocular pressure usually more than 40mmHg (normal IOP <22mmHg)

1. **SINUSITIS:**

- Usually pain between the eyes or forehead on the sinuses
- Usually there is coryza symptoms: sneezing, running nose and cough
- Facial pain which is worse on bending forward

Investigation: CT Scan

Treatment: Antibiotics +/- washout of the sinuses

1. **BENIGN RAISED INTRACRANIAL PRESSURE (pseudotumour cerebri)**

- This is common in young obese women
- Morning headaches
- Papilloedema
- 6th nerve palsy
- Plus or minus diplopia
- Signs of raised intracranial pressure i.e. headache, vomiting, papilloedema

Investigation: CT head to rule out brain tumour

Treatment: weight loss, acetazolamide

1. **BRAIN TUMOUR:**

- Usually progressive headache
- Usually elderly patient
- Signs of raised intracranial pressure (papilloedema, vomiting, headache)
- Plus or minus focal neurological symptoms (e.g. weakness or sensory loss in the limbs)

Investigation: CT brain

Treatment:

1. Dexamethasone to reduce raised ICP or as treatment of headaches
2. Surgery if no metastasis
3. Radiotherapy if metastasis

1. **TENSION HEADACHE:**

- Bilateral band-like headache, usually comes when patient is stressed

Treatment: Paracetamol/ aspirin/ ibuprofen or stronger painkillers

1. **SUBARACHNOID HAEMORRHAGE:** please see above
1. **INTRACRANIAL HAEMORRHAGE:** please see above
1. **MENINGITIS:** please see above

DIZZINESS OR LOSS OF CONSCIOUSNESS

1. **CARBON MONOXIDE POISONING:**

- This is usually due to leaking gas in the house therefore other family members will be affected, there is history of problems with boilers or gas in the house.
 - Carbon monoxide poisoning can also occur whilst painting, as it is contained in paints.
 - Carbon monoxide poisoning can also occur in house fire incidents. Usually there is singed nasal hair, or coughing black sputum
- Investigation: serum carbon monoxide levels

Treatment:

1. 100% oxygen (1st choice)
2. Hyperbaric 100 % oxygen
3. if patient is unconscious then intubate and ventilate with 100% oxygen

1. **HYPOGLYCAEMIA: this is serum glucose less than 3mmol/l**

- Loss of consciousness with sweating is always hypoglycaemia until proven otherwise
- There is history of diabetes or alcohol abuse
- Repeated loss of consciousness after missing meals suggests insulinoma

Investigation: serum blood glucose levels or capillary blood glucose

Treatment: IV 50% glucose 50ml or 10% glucose

N.B: other causes could be insulinoma in which there is a tumour of the pancreas, which produces insulin (usually presents with loss of consciousness every time a patient misses her meals). Investigation for this is serum insulin levels followed up by CT scan pancreas to localise the tumour

Treatment: Surgery

1. **VASOVAGAL SYNCOPE: it is due to overactivity of the vagus nerve which causes severe bradycardia leading to hypo-perfusion of the brain and collapse. There is a short-lived loss of consciousness**

- This is usually in young girls
- Loss of consciousness usually less than 2 minutes
- Precipitated by long standing and unpleasant situation like pain, seeing blood or observing an operation.
- Patient usually go pale before falling down
- No investigation required simply reassure the patient

1. **STOKE ADAMS:**

- There is transient arrhythmia. It is transient complete heart block which leads to hypoperfusion of the brain cause confusion or TIA.
- Any elderly patient with repeated collapse or syncope without warning is always Stoke Adams until proven otherwise
- Patient usually go pale before falling

Investigation: 24 hour ECG (ambulatory ECG)

Treatment: may need permanent pace maker

1. **EPILEPSY:**

- This is usually associated with jerking of the limbs with urinary or faecal incontinence or tongue biting
- Usually preceded by aura
- There is post ictal status

1. **MENINGITIS:**

- Any patient with loss of consciousness and rash is always meningitis until proven otherwise
- Please see under section of meningitis for more details.

1. **POSTURAL HYPOTENSION;**

Any patient with hypertension and on treatment with some anti-hypertensive medication especially bendroflumethiazide and has repeated falls the cause is always postural hypotension until proven otherwise.

Investigation: Standing and lying blood pressure the difference between the two should be more than 20 mmHG

Treatment: Review antihypertensive medication

1. **SITUATIONAL SYNCOPES:**

This is when people lose consciousness in situations like when opening bowels, laughing, or sneezing.

1. **MENIERES DISEASE: it does not cause loss of consciousness but causes dizziness**

Patient usually has DVT (Deafness, Vertigo and Dizziness)
Patient could be on anti-emetics like prochlorperazine

1. **ANAEMIA:**

- Anaemia causes light headedness. When you see the symptom of light headedness think of anaemia first as very few things actually cause light headedness.
- Patient usually on aspirin or NSAIDS which lead to GI bleed and anaemia

Investigation: FBC for haemoglobin and then gastrointestinal endoscope

1. **HYPERTROPHIC OBSTRUCTIVE CARDIOMYOPATHY (HOCM)**

- This is a congenital abnormality in which there is hypertrophy of the muscles of the heart.
- Common in young males
- Autosomal dominant
- There is usually family history of sudden death

Investigation: Echocardiogram
HOCM is part of long Q-T syndrome

Treatment: B-blockers for symptomatic relief

1. **AORTIC STENOSIS:**

- This can be either congenital or acquired
- If congenital it will be in a young patient or child

- Acquired will be in elderly
 - Common presentation is dizziness or syncope on exercise e.g. while in the gym
 - Therefore dizziness or syncope on exercise is always aortic stenosis until proven otherwise
- Ix: Echo
- TREATMENT: Surgery: Aortic valve replacement

1. **SUBARACHNOID HAEMORRHAGE:**

Sudden onset of headache is always subarachnoid haemorrhage until proven otherwise.

1. **SUBDURAL HAEMATOMA:**

This is usually common in alcoholics and elderly with recurrent falls.

1. **ALCOHOL INTOXICATION:**

Where there is alcohol there are 3 possible causes of loss of consciousness:

- Subdural haematoma
- Hypoglycaemia
- Intoxication

Always start the assessment by check blood glucose.

In intoxication they usually wet themselves and smell of alcohol and they have slurred speech.

1. **DRUG TOXICITY:**

These are usually young patients who present with delusion or haemodynamic instability

1. **ANXIETY:**

- Common in young women.
- Difficulty in breathing and generalised chest pain
- Also tingling and numbness in the hands and lips
- feeling of impending doom
- feeling they have catastrophic disease eg stroke or heart attack

Treatment: Re-breathing bag during an acute attack

1. **HYPOXIA:**

Usually this is associated with shortness of breath and there is cyanosis.
there is different causes e.g COPD, Asthma or pneumonia

1. **OPIATE OVERDOSE:**

- This will cause pin point pupils and respiratory depression. So the respiratory rate will be less than 12.
- Puncture marks on the arms which suggests IV drug abuse

Treatment: Naloxone

1. **HYOTHERMIA:**

- Patient are usually shaking because they are feeling cold
- Low temperature usually less than 35 degrees
- ECG shows J waves

TREATMENT: 1. give warm IV fluid
2. give blankets

1. **STROKE:**

- Usually sudden onset of symptoms with dysphasia or weakness on the limbs
- Facial asymmetry

1. **INTRACEREBRAL BLEED:**

- This is common in patients with untreated or uncontrolled hypertension.
- Usually there is sudden headache as well or it can simply present with loss of consciousness.

1. **DIABETES:**

- This will cause loss of consciousness due to either hypoglycaemia or hyperglycaemia.
- Hypoglycaemia is usually sudden onset and common in diabetic patient or medication like sulfanyluria (Gliclazide and glibenclamide) or insulin.
- Hyperglycaemia can either be diabetic ketoacidosis or hyperglycaemic hyperosmolar non-ketotic (HONK) coma.
- Diabetic ketoacidosis and HONK is gradual onset and there is increasing drowsiness and dehydration.
- Also there is Kussmaul breathing in which there is deep, fast and sighing respiratory.

Investigation:

- a. Serum or capillary blood glucose is initial
- b. Arterial blood gas is diagnostic.

1. **PULMONARY EMBOLISM:**

- Young woman with sudden onset of chest pain or shortness of breath with risk factors of pulmonary embolism/deep vein thrombosis
- Please see respiratory medicine notes

1. **DISSECTING AORTIC ANEURYSM:**

- Chest pain or abdominal pain radiating to the back.
- For thoracic aneurysm there different blood pressure and pulses in each arm.
- For abdominal aneurysm there radial femoral delay or absent femoral pulses and pulsatile mass in the abdomen.

N.B: Abdominal or chest pain radiating to the back is always aortic aneurysm until proven otherwise.

1. **HEPATIC OR WERNICKE'S ENCEPHALOPATHY:**

- There is usually history of alcohol abuse and stigmata of liver disease.
- Hepatic or Wernicke encephalopathy will present with progressive drowsiness.
- Sudden loss of consciousness in a patient with liver disease suggests hypoglycaemia, but gradual onset of loss of consciousness may suggest hepatic encephalopathy.

1. **ATRIAL FIBRILLATION:**

Irregularly irregular pulse is always Atrial fibrillation until proven otherwise.

1. **BRADYCARDIA:**

- There is slow pounding heart beat and pulse is less than 60.
- If heart rate less than 40 then its complete heart block.

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[Back](#)



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