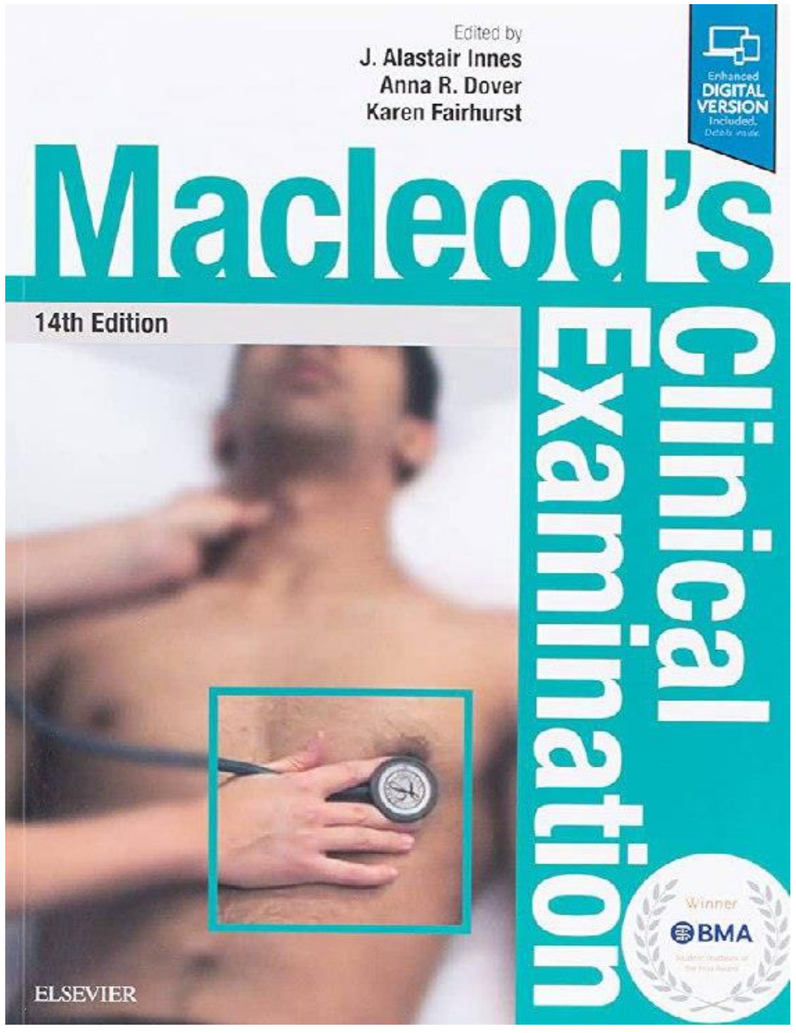

Outlines:

- Anatomy & Physiology.
- Common symptoms history.

Done By: Abdullah O. Alwikhyan , MD.
Introductory: Section 2, CH.7: Nervous System.
Note: This summary contains all Macleod's important notes.

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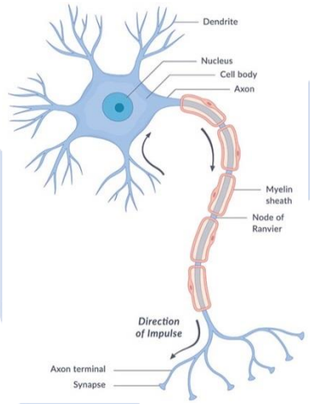
Nervous System History

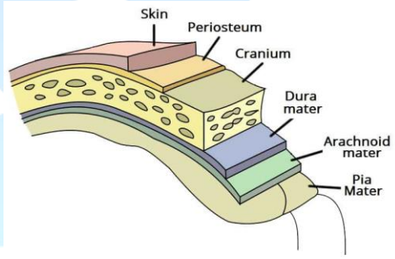
Anatomy



- The nervous system consists from **CNS & PNS .**
- CNS consists from **brain** and **spinal cord.**
- PNS consists from **somatic** and **autonomic nerves.**

- The neuron is the **functional unit** of the nervous system.
- Each neuron has a **cell body** and **axon** terminating at a synapse, supported by **astrocytes and microglial cells**.
- **Astrocytes** provide the structural framework for the neuron, **control their biochemical environment** and form **the blood– brain barrier.**
- **Microglial cells** are **blood-derived mononuclear macrophages** with immune function.
- **In the CNS**, myelin is produced by **oligodendrocytes**.
- **In the PNS**, myelin is produced by **Schwann cells.**

✓Meninges



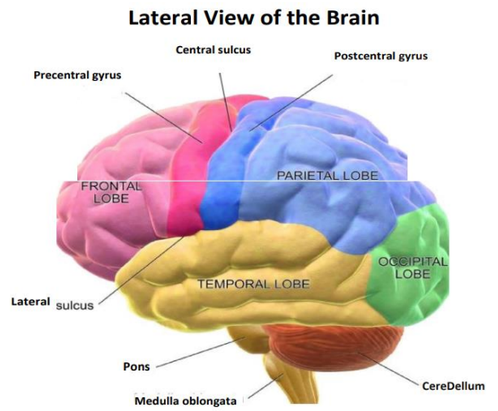
- Brain and spinal cord are covered with **three membranous layers** called the meninges: **dura mater** next to the bone, **arachnoid** and **pia mater** next to the nervous tissue.

✓CSF

- The subarachnoid space between the **arachnoid and pia** is filled with cerebrospinal fluid (CSF) produced by the **choroid plexuses.**
- The total volume of CSF is between **140 and 270 mL** and there is a turnover of the entire volume 3–4 times a day .
- **Rate of production 700 mL per day .**

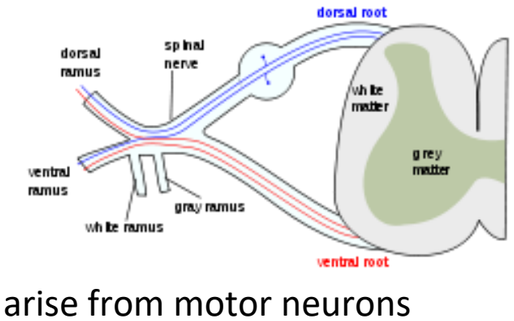
✓Brain

- Two cerebral hemispheres, each with **four lobes (frontal, parietal, temporal and occipital),** the brainstem and the cerebellum.
- The **brainstem** comprises **the midbrain, pons and medulla.**
- The **cerebellum** has two hemispheres and a central vermis attached to the brainstem by three pairs of cerebellar peduncles.

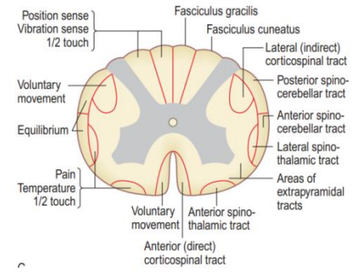


✓Spinal cord

- The spinal cord is the **main pathway for information** connecting the brain and PNS.
- contains **ventral grey horn & dorsal grey horn.**



- **Ventral roots** consist of efferent fibers that arise from motor neurons found in ventral grey horns.
- The **dorsal roots** are afferent fibers, receiving senso ry information from organs to be transmitted to brain through sensory neurons found in dorsal grey horn.



The spinal cord contains multiple tracts :

1. Dorsal column (fasciculus gracilis and fasciculus cuneatus) : Propioception , vibration.

2. Anterior & lateral corticospinal tracts: voluntary movements

3. Anterior & lateral spinothalamic tracts: pain , tempertaure .

4. Spinocerebellar tract: equilibrium

Peripheral nervous system

- Peripheral nerves may have myelinated or unmyelinated axons.
- Contains somatic and autonomic nerves .
- Somatic nerves: consist of sensory and motor nerves.

History

- **The history is a the key for diagnosis** as physical exam may be normal or unhelpful.
- In cases of **amnesia or loss of consciousness** we need additional **witness history.**
- We should **clarify exactly** what the patient means by any neurological symptom.
- Ask the patient **what they fear might be wrong.**
- For any neurological symptom ask about **onset , duration , pattern , exacerbating , relieving factors and associated symptoms.**

Symptoms

1-Headache

1. May be either **Primary** or **Secondary**.
2. Use **SOCRATES** to analyze it
3. **Isolated headache** with **a truly abrupt onset** may represent a potentially serious cause such as **Subarachnoid Haemorrhage** or **Cerebral Vein Thrombosis**, whereas **recurrent headache** is much more likely to be **benign** primary headache.

✓ **Primary (idiopathic) causes**

1. Migraine 2.Tension Headache 3.Trigeminal Autonomic Cephalalgias (Including Cluster Headache) 4. Primary Stabbing Headache 5. Cough, Exertional Or Sex Headache 6. Primary Thunderclap Headache

✓ **Secondary (or symptomatic) headaches**

• **Meningitis**: associated with **neck stiffness, fever, rash, signs of raised intracranial pressure** and **false localizing signs, meningism.**

• **Subarachnoid hemorrhage:** Abrupt onset,may be **fatal** at onset ,associated with **nausea/ vomiting, reduced consciousness**, 3rd palsy.

• **Temporal arteritis:** usually occur in patients **more than 55 yrs,** presents with **jaw pain on chewing, visual symptoms** , and **tender temporal arteries, elevated ESR** and **CRP.**

Migraine

• **Recurrent attacks** of **moderate to severe** headaches.
• Mostly **unilateral.**
• Evolve over **30 minutes to 2 hours** , lasting **up to 72 hours**, with weeks to months of **symptoms free.**
• Classified into **Classic (With Aura)** and **Common (Without Aura).**
• Associated with **Nausea/Vomiting, Photophobia/Phonophobia**
• During the attack the patient prefers to be in a **dark room .**

Cluster headaches

• **Abrupt** onset , Attacks **last up to 2 hours.**
• **Recurrent** attacks **1-4 times within 24 hours** , lasting weeks to months , with months to years of remission.
• **Awake the patient** from sleep.
• Orbital/retro-orbital; **Always Same Side During Cluster**, may switch sides between clusters
• Autonomic features, including **conjunctival injection, tearing, nasal stuffiness, ptosis, miosis, agitation**
• During the attack the patient keep pacing around the room in an agitated state, or even head banging.

Stabbing headache

• **Abrupt** onset
• Last **very briefly** , seconds or less
• **Anywhere**
• Common in patients **with migraine**

2-Disturbances Of Consciousness

****Causes:**

1. **Postural hypotension.**
2. Neurocardiogenic syncope **(Vasovagal).**
3. **Hypersensitive carotid sinus syndrome** (pressure over carotid sinus may lead to reflex bradycardia and syncope).
4. **Cardiac syncope** due to arrhythmias or mechanical obstruction of cardiac output.

Syncope

- Most common cause of **transient loss of consciousness.**
- Due to **inadequate cerebral perfusion**.
- May be due to **vasovagal (reflex) or cardiac syncope.**

1. Vasovagal Syncope

- It occurs due to **stimulation of parasympathetic system** due to **Pain , Emotion** or **illness** or in **people forced to stand in warm environment.** Leads to vasodilation and bradycardia.
- Often **preceded by light-headedness, vision dimming, tinnitus** & **nausea.**
- Lasts **1-2 minutes.**
- It causes **pale or grey skin**
- May be associated with myoclonic jerks
- If kept flat, recovery is rapid

2. Cardiac syncope

- Syncope with **No Previous Alarm Or Trigger Or Exercise**.
- **Causes**: **hypertrophic cardiomyopathy, severe aortic stenosis or arrhythmia.**

Postural hypotension

- Could be due to
  1- drugs (levodopa or anti hypertensive drugs)or
  2- autonomic diseases such as DM
  3-in people more than 65 years
  4- Hypovolemia

How to ask about syncope??

- Ask about **witness**
- **any preceding symptoms** (palpitation, chest pain, lightheadedness, nausea, tinnitus, sweating and visual disturbance).
- **Duration** of loss of consciousness.
- **Appearance** of the patient while unconscious.
- Any **injuries sustained.**
- **Time to recovery** to full consciousness and normal cognition

3- Epileptic Seizures

- **Paroxysmal electrical discharges** from either the **whole brain (generalized)** or **part of the brain (focal).**
- The **history** from the patient and witnesses can help distinguish epilepsy from syncope
- Usually triggered by **sleep deprivation or alcohol or drugs.**
- **Types:**
  1. Generalized: tonic–clonic seizure MC form **2. Focal (partial)**

Tonic clonic seizure

- **Tonic phase:** typically follows a stereotyped pattern with early loss of consciousness associated with body stiffening
- **Clonic phase**: rhythmical jerking subsiding over 0.5 – 2 minutes

- **Postictal phase**: period of **unresponsiveness** often with heavy breathing, the patient appears **to be deeply sleep and finally confusion as the patient awakes.**

7.2 Features that help discriminate vasovagal syncope from epileptic seizure		
Feature	**Vasovagal syncope**	**Seizure**
Triggers	Typically pain, illness, emotion	Often none (sleep deprivation, alcohol, drugs)
Prodrome	Feeling faint/ lightheaded, nausea, tinnitus, vision dimming	Focal onset (not always present)
Duration of unconsciousness	<60 s	1–2 mins
Convulsion	May occur but usually brief myoclonic jerks	Usual, tonic–clonic 1–2 mins
Colour	Pale/grey	Flushed/cyanosed, may be pale
Injuries	Uncommon, sometimes biting of tip of tongue	Lateral tongue biting, headache, generalised myalgia, back pain (sometimes vertebral compression fractures), shoulder fracture/ dislocation (rare)
Recovery	Rapid, no confusion	Gradual, over 30 mins; patient is often confused, sometimes agitated/ aggressive, amnesic

Focal seizure

• **Simple** (consciousness is preserved) or **complex** (impaired consciousness)

• Characterized by **whichever part of the brain is involved**

- **Frontal lobe seizures**: focal **motor** seizure.

- **Temporal lobe seizures** characterized by **autonomic and/or psychic symptoms**, often associated with **automatisms** such as lip smacking or swallowing.

Difficult to distinguish from epileptic seizures, clues to differentiate psychogenic seizures:

1. occurring **multiple** times in a day.
2. may last considerably **longer.**
3. symptoms **waxing and waning.**

Functional dissociative attacks(non- epileptic or psychogenic attacks or pseudoseizures)

4. **asynchronous** movements.
5. pelvic thrusts , **side-to-side** rather.

than flexion/extension movements.

6. **absence** of postictal **confusion.**

• The widespread availability of videophones allows witnesses to **capture such events.**

4- Stroke symptoms

- **STROKE** is a focal **neurological deficit of rapid onset** that is due to a vascular cause , maybe **ischemic** or **hemorrhagic**.

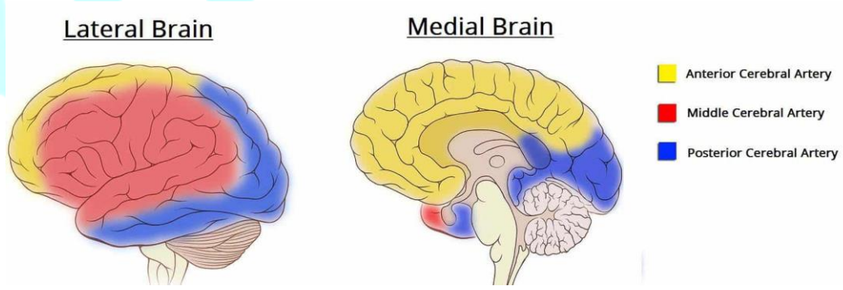
- **Transient Ischaemic Attack (TIA)** is the same but symptoms **resolve within 24 hours.**

• TIAs are an important risk factor for impending stroke and demand urgent assessment and treatment.

• Symptoms are dictated by the vascular territory involved

- Much of the cerebral hemispheres are supplied by **the anterior circulation** (**Anterior and Middle cerebral arteries** which are derived from the **internal carotid artery**) .

- **the occipital lobes and brainstem are supplied by the posterior circulation** (**Posterior Cerebral Artery** which is derived from vertebrobasilar circulation).



Ischemic And Hemorrhagic Stroke

- **80**% of strokes are **ischemic**
- **Hemorrhagic** stroke is much more frequent in **Asian populations.**
- Factors in the history or examination that increase the likelihood of **haemorrhage include:**
  Use Of Anticoagulation, Headache, Vomiting, Seizures And Early Reduced Consciousness.
- We have to do **brain CT without contrast** to differentiate between them.
- Isolated vertigo, amnesia or TLOC are rarely, if ever, due to stroke.

Spinal strokes

- very rare; patients **present with abrupt onset , depending on the level of spinal cord affected.**
- **Anterior Spinal Artery Syndrome** is MC , causes loss of motor function , pain/temperature sensation, with sparing of joint position & vibration sensation **below the level of the lesion(sparing dorsal column).**

5-Dizziness and Vertigo

Dizziness :

- Recurrent **dizzy spells affect approximately 30% of those over 65 years**.

• **Causes :**

1- Postural hypotension
2- Cerebrovascular disease
3- Cardiac arrhythmia
4- Hyperventilation induced by anxiety and panic.

Vertigo: the **illusion of movement.**

• indicates a problem in **the vestibular apparatus (Peripheral)** (most common) or **the brain (Central).**

Peripheral Causes Of Vertigo:

1- **Benign paroxysmal positional vertigo (BPPV):** recurrent episodes of vertigo lasting **a few seconds** , attacks increased **when sleeping on the affected side** or with **movement.**
2- **Meniere disease: vertigo lasting minutes or hours, associated** with **hearing loss, tinnitus, nausea** and **vomiting.**

Central causes of vertigo:

1- Migrainous vertigo (with or without headache)
2- Stroke
3- Multiple sclerosis
4- TIAs do not cause isolated vertigo.

6-Functional/ Psychogenic / Hysterical / Somatization / Conversion Disorder

- **Not due to a true neurological disease**
- Presentations include **blindness, tremor, weakness** and **collapsing attacks,** and patients will often describe **numerous other symptoms**, with **fatigue, lethargy, pain, anxiety** and other mood disorders commonly associated.

Clues include:

1- Symptoms **not compatible with disease** (such as retained awareness of convulsing during nonepileptic attacks, or being able to walk normally backwards but not forwards)
2- considerable **variability in symptoms** (such as intermittent recovery of a hemiparesis)
3- **multiple symptoms** with numerous visits to other specialties and multiple unremarkable investigations, leading to numerous different Diagnoses.

• Most functional neurological disorders follow recognizable patterns, so be cautious when the pattern is atypical.

Past medical history

- History of **previous visual loss (optic neuritis**) in someone presenting with numbness suggests **multiple sclerosis**.
- **Birth history** and **development** may be significant, as in **epilepsy**.
- If considering a vascular cause of neurological symptoms, ask about important risk factors, such as other **vascular disease, hypertension, family history and smoking.**

Drug history

- Always enquire about drugs, including prescribed, over-the counter, complementary and recreational/illegal ones.
- **Phenytoin** toxicity causes **ataxia.**
- Excessive intake of **simple analgesia** causing **Medication Overuse Headache;** use of **cocaine** provoke **convulsions.**

Family history

- Parental **Consanguinity** is common, increasing the risk of autosomal recessive conditions.
- **Single-gene defects**: such as **myotonic dystrophy or Huntington's disease.**
- **Polygenic influences**, as in **multiple sclerosis** or migraine.
- Mitochondria uniquely have their own DNA, and abnormalities in this DNA can **cause a range of disorders** that manifest in many different systems (such as diabetes, short stature and deafness), and may cause common neurological syndromes such as migraine or epilepsy.
- Some diseases, such as **Parkinson's or motor neuron disease, may be either due to single-gene disorders or sporadic.**

Social history

- How are patients **coping** with their symptoms? Are they **able to work and drive**?
- **Alcohol** it affects CNS (ataxia, seizures, dementia) & PNS (neuropathy)
- Ask about **diet**
  - **Vitamin deficiency** may occur in **alcoholism or dietary exclusion.**
  - **Vegetarians** may be susceptible **to vitamin B12 deficiency (Subacute Combined Degeneration Of The Spinal Cord).**
- Ask about recreational drugs
- **Nitrous Oxide Inhalation** causes subacute combined degeneration of the cord due to dysfunction of the vitamin B12 pathway
- **Smoking** contributes to vascular and malignant disease.
- A **Travel History** may give clues to the underlying diagnosis such as:
  - Lyme disease (facial palsy)
  - Malaria (coma)
- Always consider **sexually transmitted or bloodborne infection,** such as human immunodeficiency virus **(HIV) or syphilis**, as both can cause a wide range of neurological symptoms and are treatable

Occupational history

- **Lead exposure** : motor neuropathy.
- **Manganese** causes Parkinsonism.
- Some neurological diagnoses may adversely affect occupation, such as **epilepsy in anyone who needs to drive or operate dangerous machinery**.
- For patients with cognitive disorders, particularly dementias, it may be necessary to patients to stop working.