

Gross Anatomy of the Nervous System (Brain & Spinal Cord), Skull & Meninges

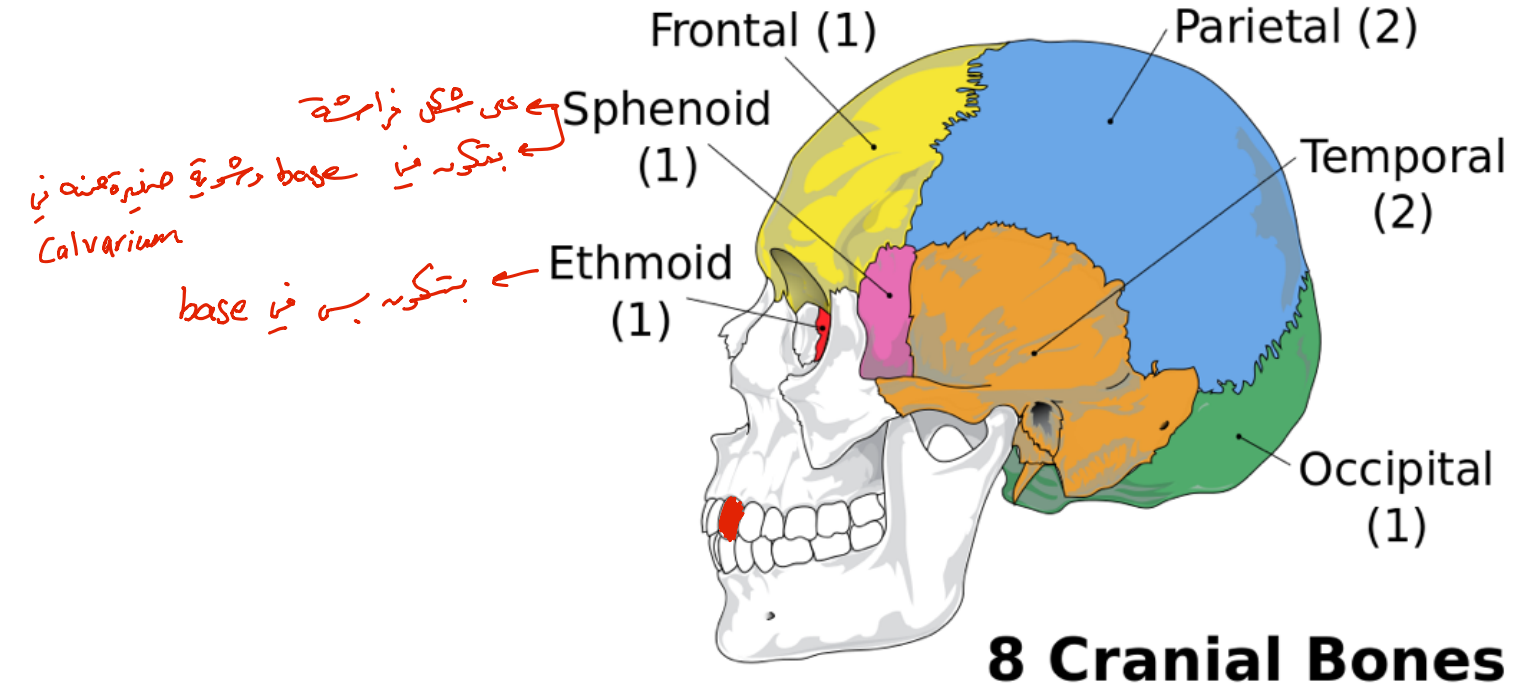
Dr. Nidal Abuahdrous

Consultant Neurosurgeon

Certificate of Arab Board of Neurosurgery

Head of Neurosurgery at European Gaza Hospital

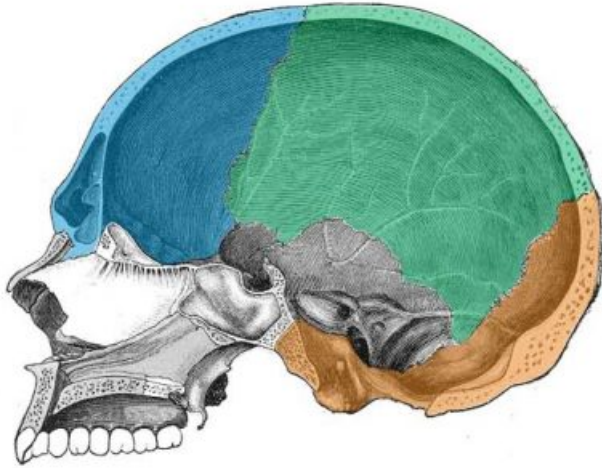
Skull



Skull

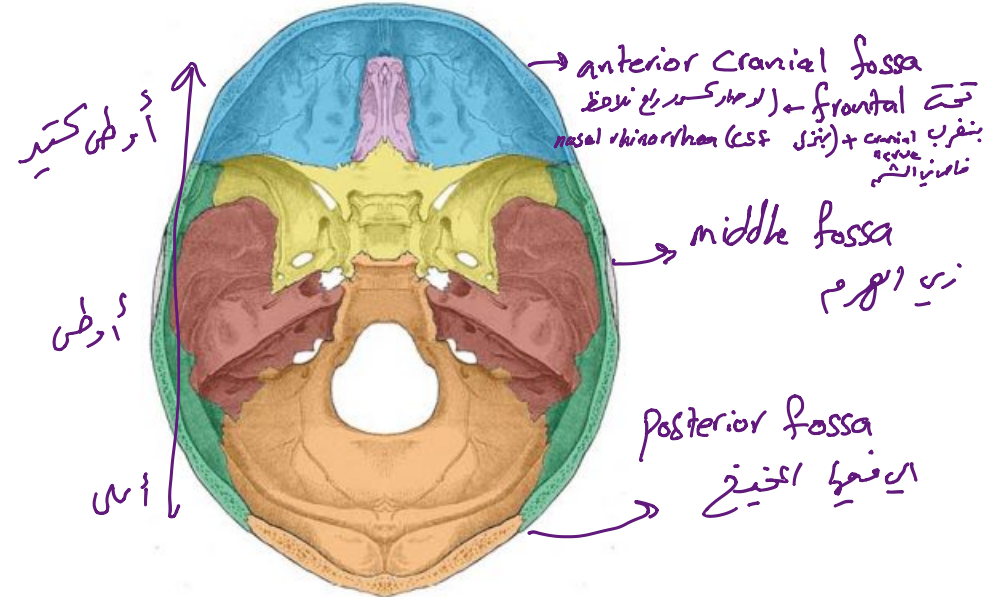
القبة (العقيرة الخارجية)

① The Calvarium (Vault)



② The skull base

تقسيم ٢١ حيزات



Frontal bone

- Unpaired bone

⑥ • Parts:

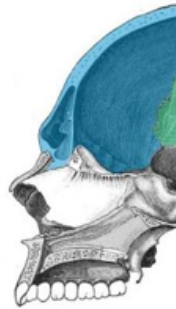
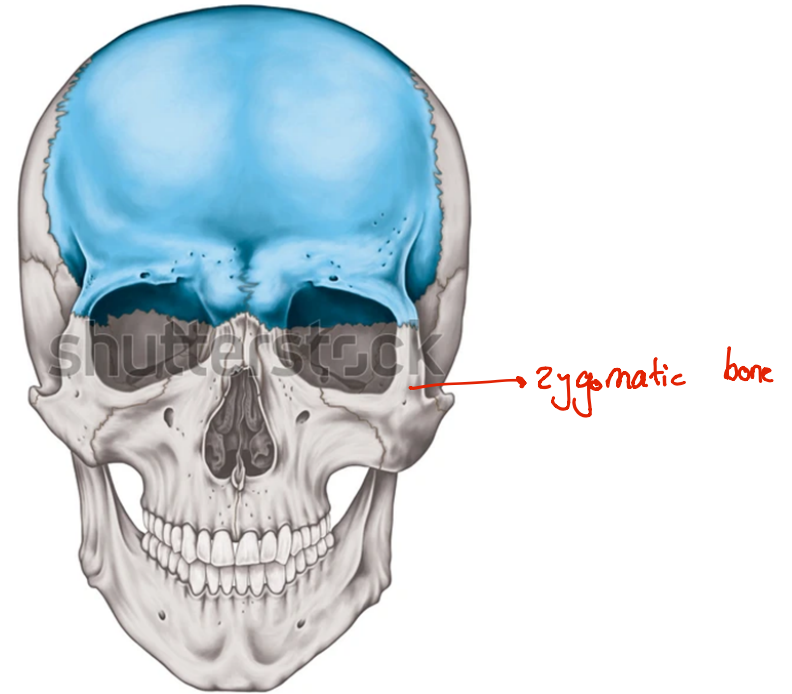
- Squamous part ^{زبي القشرة}
- Nasal part
- 2 orbital plates ^{سقف حجرة العين}
- 2 zygomatic processes

- Contains 2 frontal air sinuses

Rt & Lt above each eye

* بصير نفعهم التهاب الجيوب Sinusitis

* دانت كرت هاي العظمة بصير عنا meningitis

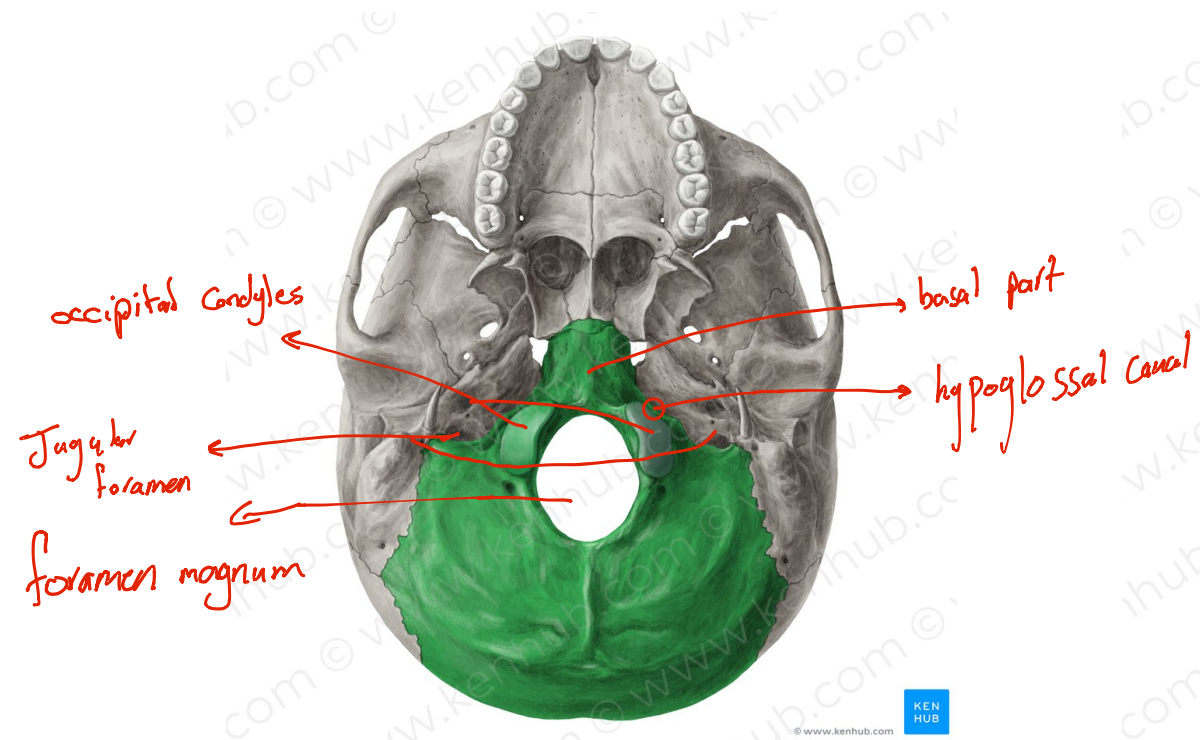
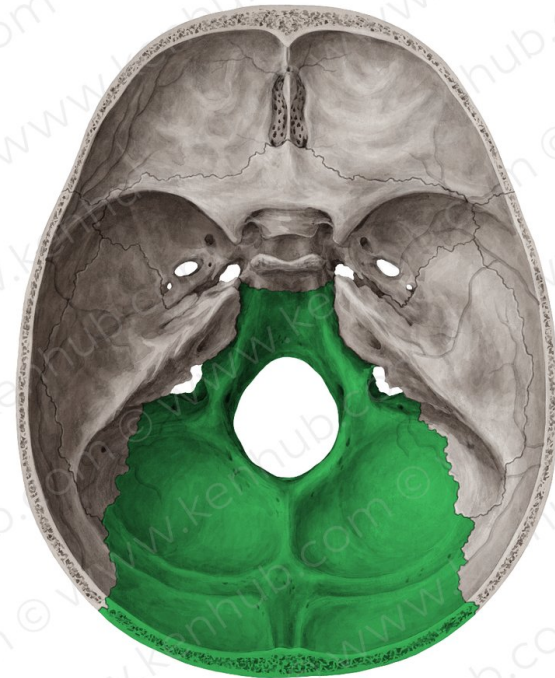


Parietal bones

- Paired
- Connects with each other in the midline (sagittal suture)
- Both connects anteriorly with frontal bone (coronal suture)
- Both connects posteriorly with occipital bone (lambdoid suture)
- Each connects down with temporal (squamous suture) & sphenoid bones.



Occipital bone



Occipital bone

- Unpaired

① Squamous part

② Basilar part

- Occipital condyles

→ atlas (C1) بقعر ال

* Foramen magnum (sp. Cord, VAs, ant. & post. sp. art., XI n., meninges)

vertebral arteries

↓ 9 10 11

↓

spinal arteries

③ 11

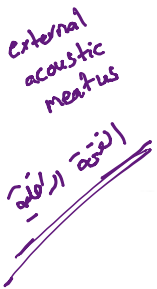
→ spine ~ سيز.

* Jugular foramen (Int. jugular V., IX, X, XI nerves)

- Hypoglossal canal (XII n.)

→ main venous return from hollow the brain

لو انکسرت راع یَعْرِ عَنی otavha



iii) ENK لڌا، ۽ ڇڏڻ ۽ ڇڏڻ.

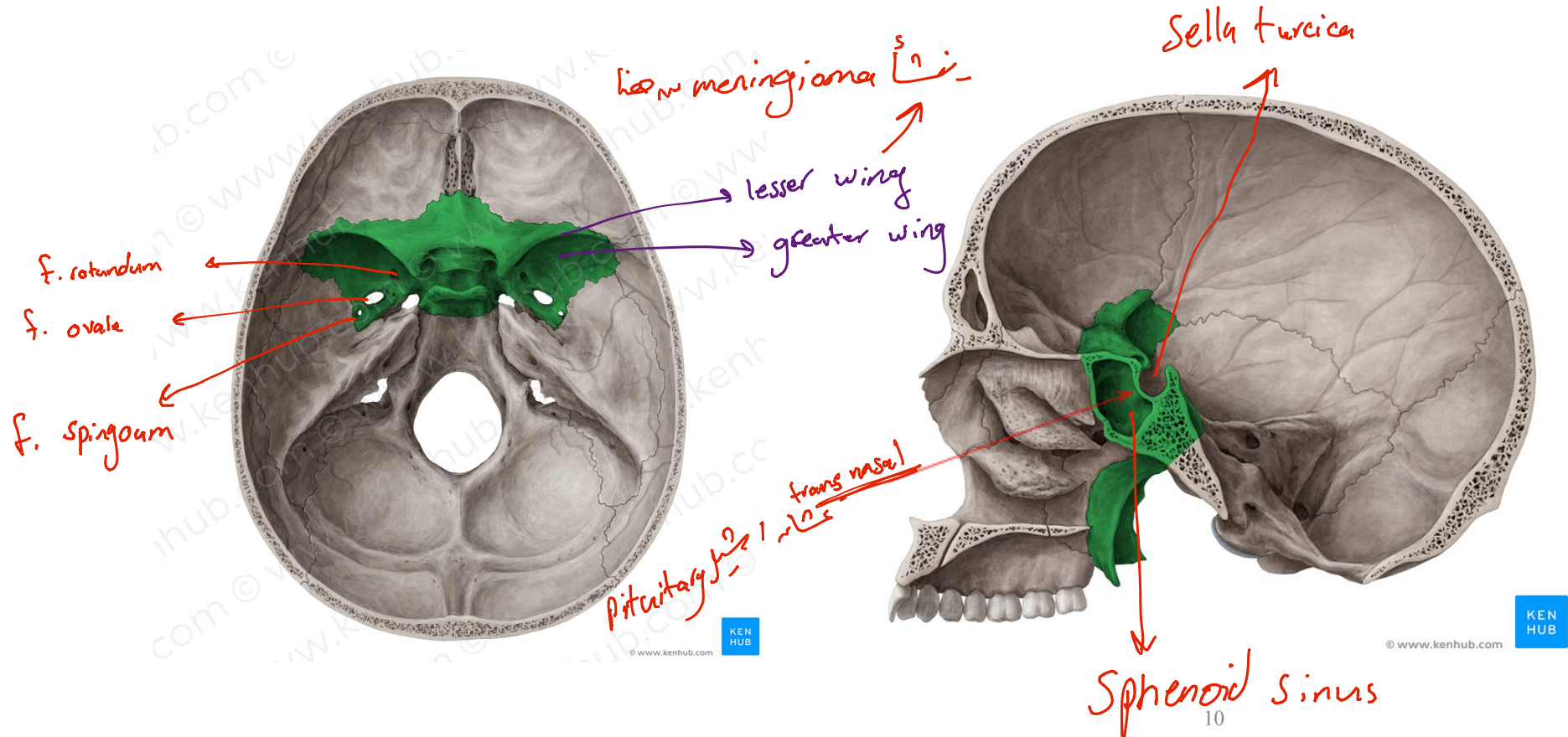
Temporal bone

بعض من العصب السمع والثاني
والعصب السابع

- * External acoustic opening/ meatus
- * Internal acoustic meatus (VII, VIII n., labyrinthine art.)
 - Carotid canal (ICA) *internal carotid artery*
 - Foramen lacerum
 - Stylomastoid foramen (VII n.)
 - Skull fracturs → Otorrhea, VII n. palsy

↓
facial nerve palsy

Sphenoid bone



Sphenoid bone

- Sella turcica (Pituitary gland)
- Sphenoid sinus
- Optic canal (II n.)
- Superior orbital fissure (between greater & lesser wings, connects middle fossa & orbit. Transmits III, IV, V-1, VI n)
- * Foramen rotundum (V-2) *الغضبي الثاني من الاصب الخامس*
- * Foramen ovale (V-3) *الغضبي الثالث من الاصب الخامس*
- * Foramen spinosum (Middle meningeal artery)

*أضغرة واهر رافعي واهر لانه
بموت*

له. بتسبب epidural hematoma - بتدوت

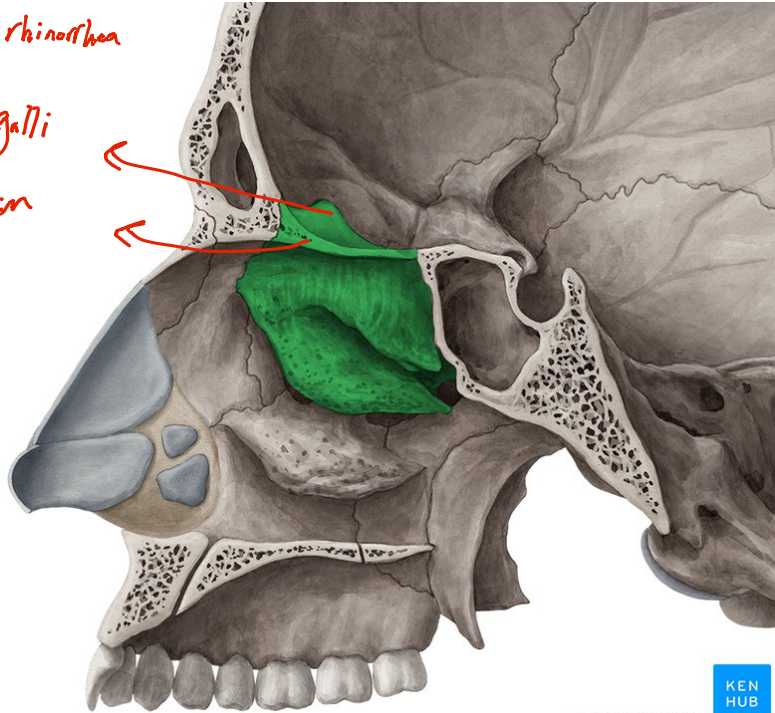
Ethmoid bone

رقيقته دلو انكرت رايه تعجل *Sausaphica meningitis*

nasal rhinorrhea

crista galli

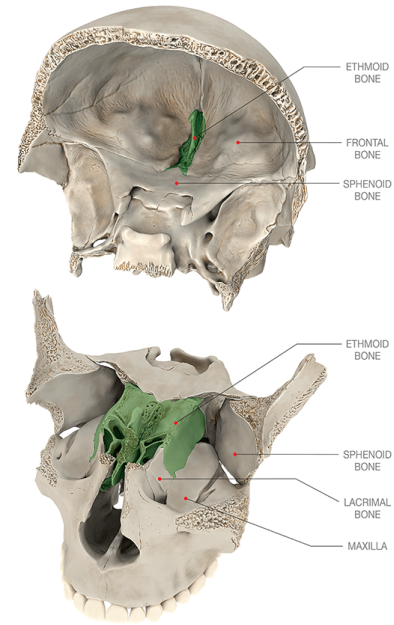
Ciribiform plate



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ETHMOID BONE



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Ethmoid bone

موجودة في مركز قاع الجمجمة

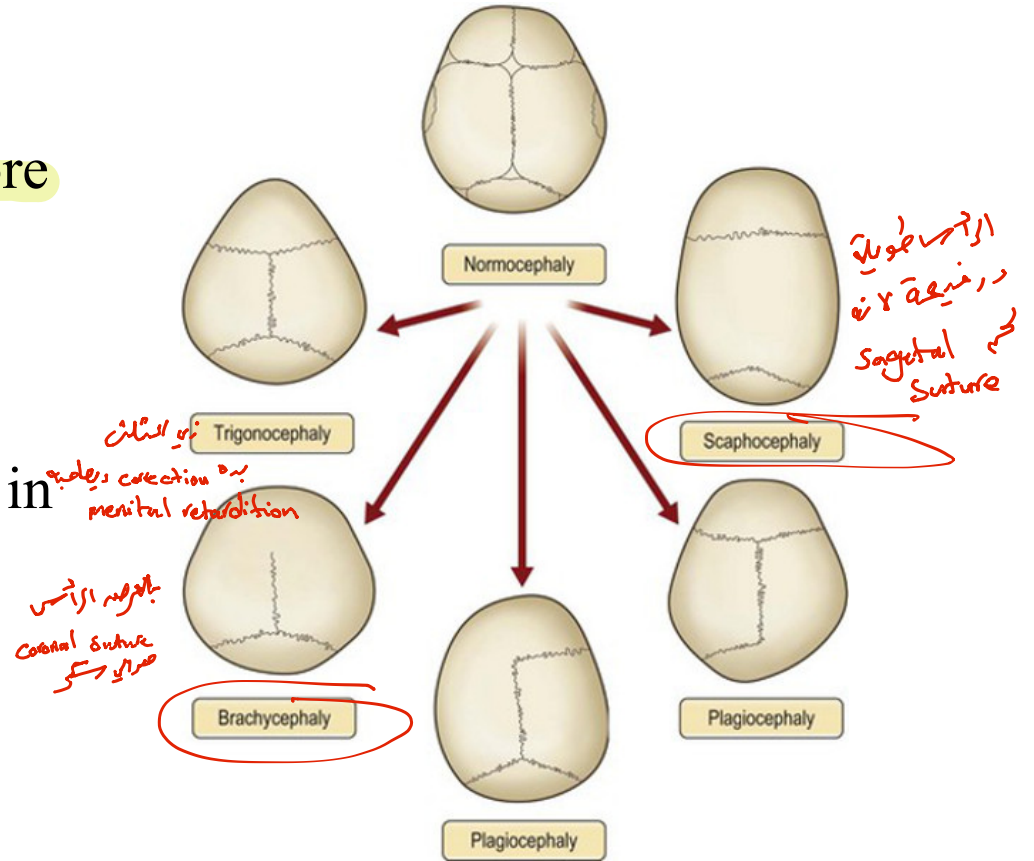
- Unpaired bone, located in the midline of the anterior cranium base
- Separates the anterior cranial fossa & the nasal cavity
- Forms the medial orbital walls ← جناحها اليسرى واليمين ←
- Cribriform plate (CN I). Fracture → Rhinorrhea, Anosmia
سحاحة
- Crista galli (attachment point for the falx cerebri)
يتم تثبيت فيها بفصل بين الدماغ اليسرى واليمين

منقبة عصب
يطلق منها
Olfactory nerve

Clinical scenarios

Craniosynostosis

- Premature closure of one or more cranial sutures in newborns
- Irregular head shape
- Sometimes high ICP
- Surgical correction is indicated in certain cases



Skull fractures

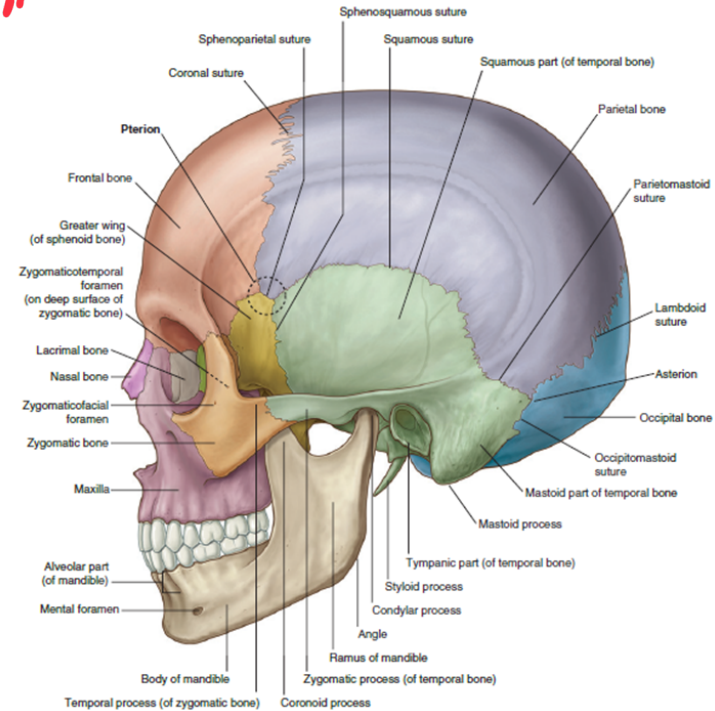
- The fracture itself is usually of little consequence نزی مشرفه د بلغم لحاله لا پېچلې پېچېس راولاړېږي
- More important: brain injury and secondary complications ښه تر څو اړخه راولاړېږي له associated سره
د م. م. ا. (middle meningeal artery) څرخ
- Classification:
 - * Closed (simple) or open (compound) → risk of infection
 - * Linear (fissure) or depressed شریخ
 - * Vault or base fractures

septic meningitis
nerve injury

Pterion

- Skull fracture → Injury to anterior branch of middle meningeal artery → EDH
- Pterional craniotomy (Common access to several intracranial pathologies)

epidural hematoma



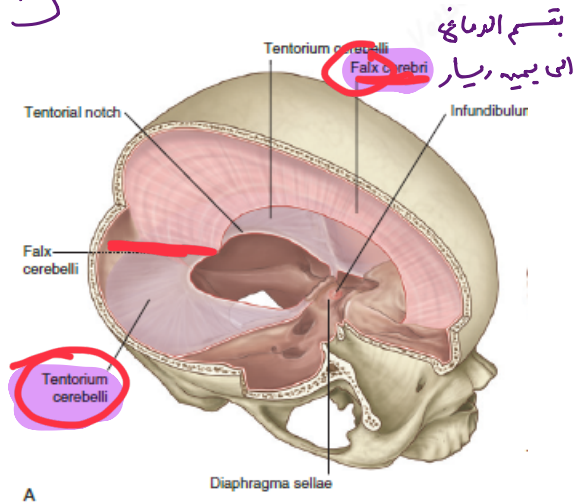
Meninges

- Surround the brain & the spinal cord
- 3 layers
 - The dura: tough, outer layer
 - The arachnoid: a delicate avascular, middle layer
 - The pia: an inner layer firmly attached to the surface of the brain
- The cranial dura consists of two layers: periosteal & meningeal
- The spinal dural: one layer only (meningeal)

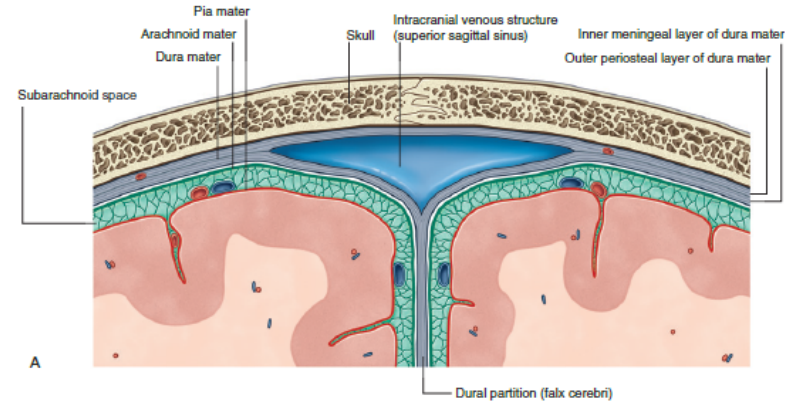
The Cranial Dura

بقسم
intercranial cavity
الى اقسام

Dural partitions



Venous sinuses



Blood supply of the cranial dura

- Anterior cranial fossa: anterior meningeal arteries from ophthalmic artery from ICA
- The middle cranial fossa: middle meningeal arteries from maxillary artery from ECA
- The posterior cranial fossa: posterior meningeal artery from ascending pharyngeal artery from ECA

Clinical scenarios

- Extradural (Epidural hematoma)
- Subdural hematoma
- Subarachnoid hemorrhage (traumatic or aneurysmal)
- CSF leak (posttraumatic, spontaneous, iatrogenic)
- Meningitis (infection of the leptomeninges)
- Meningioma (extra-axial tumor, originate from arachnoid cap cells)

ب. القزم و dura

تحت dura وغوص arachnoid

بفتح نية و vessel major

ابنھا عصف
اسود القزانی
CT

Extradural & Subdural hematoma

خارجية

Extradural



داخلية القحف

Subdural



Subarachnoid hemorrhage

Spontaneous (aneurysmal)



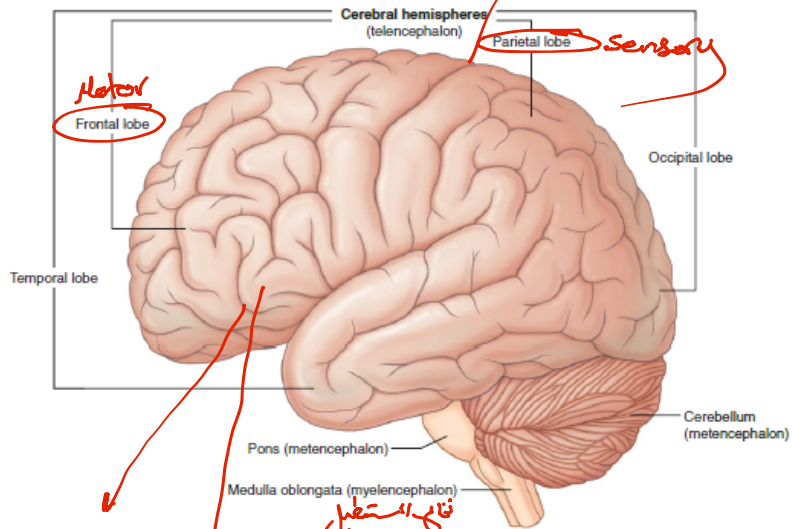
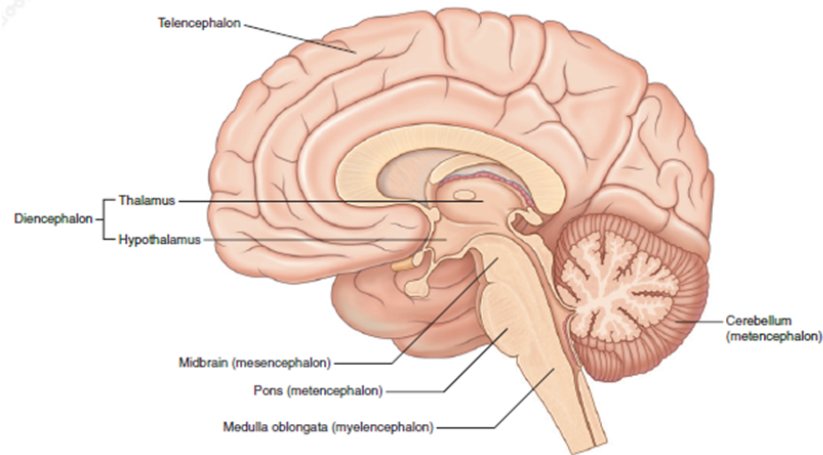
Traumatic



Brain

- Telencephalon (cerebrum)
- Diencephalon (thalamus, hypothalamus)
- Mesencephalon (midbrain)
- Metencephalon (Pons & Cerebellum)
- Myelencephalon (medulla oblongata)

Brain



التجويف الدماغي
حاجبه التجويفين

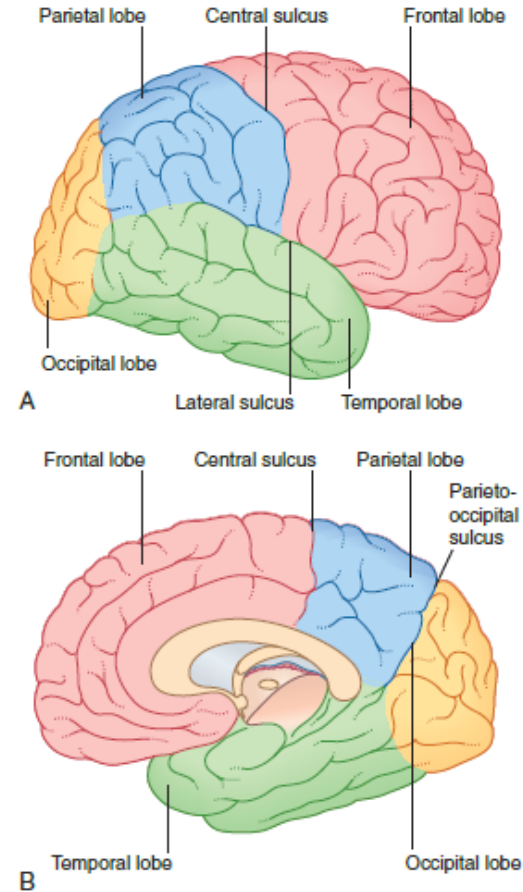
Cerebrum

telenecphelon

- 2 hemispheres

- 4 lobes in each hemisphere

- Frontal
- Parietal
- Temporal
- Occipital

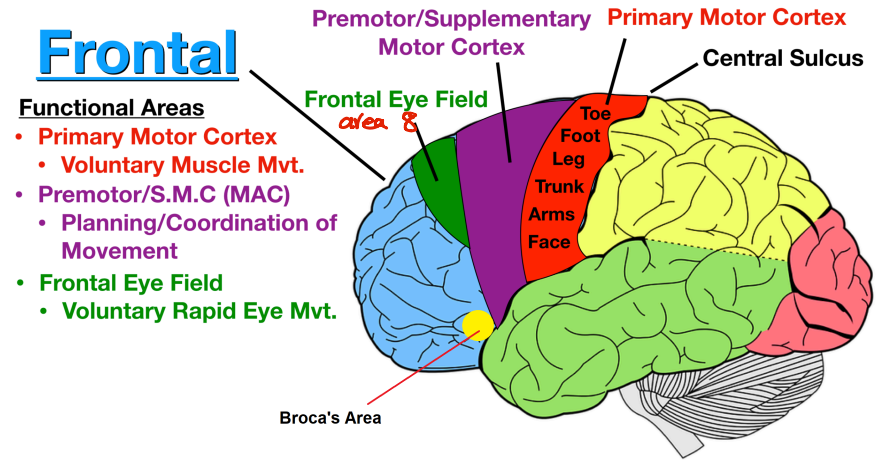


Frontal lobe

- Contralateral weakness
- Motor ^{لنطق} "Broca's" dysphasia (in dominant side damage)
- Behavior changes
- Gaze paralysis to contralateral side → at area 8

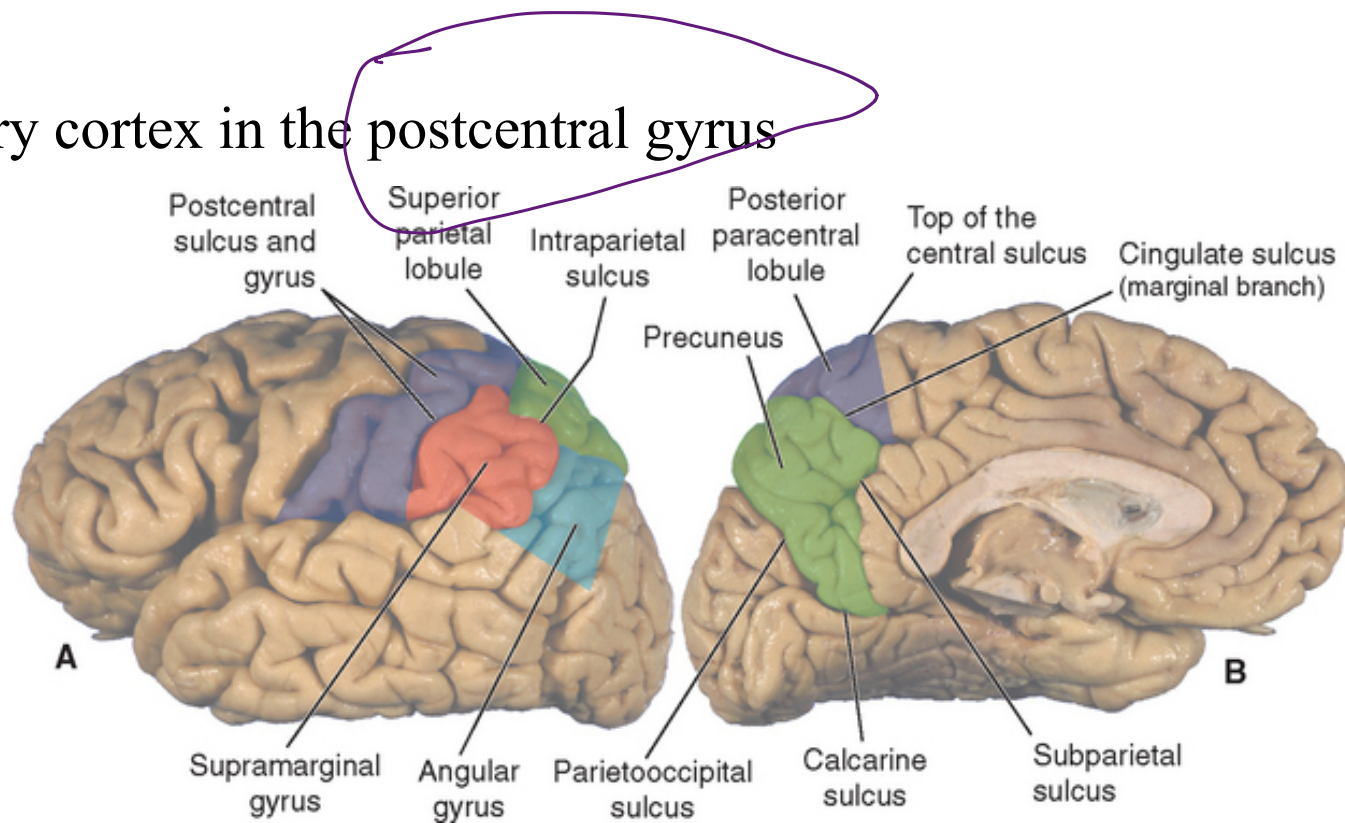
حركة العينين مع بعض

Rt side في area 8 يتسبب الشلل في Lt side
 Lt side " " " " = Lt side



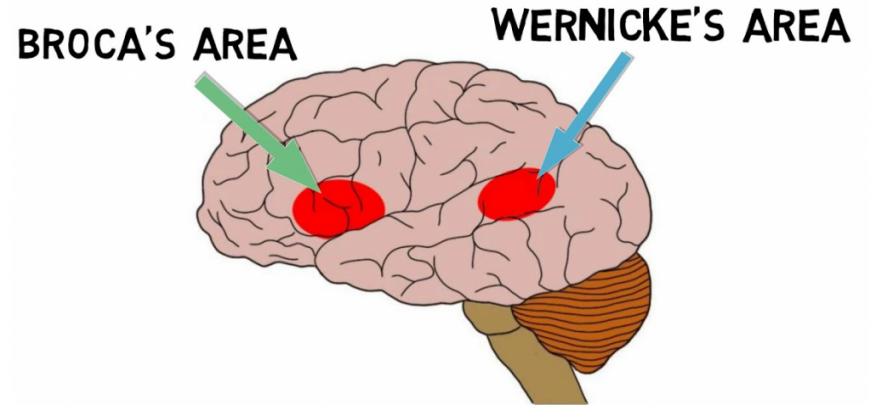
Parietal lobe

- Sensory cortex in the postcentral gyrus

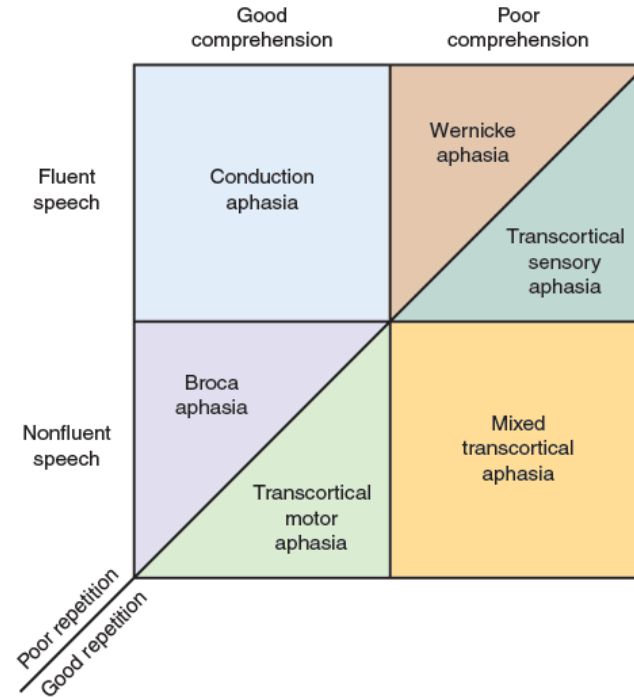


Temporal lobe

- ✂ Sensory dysphasia (Wernicke's)
- ✂ Auditory cortex
- ✂ Olfactory cortex



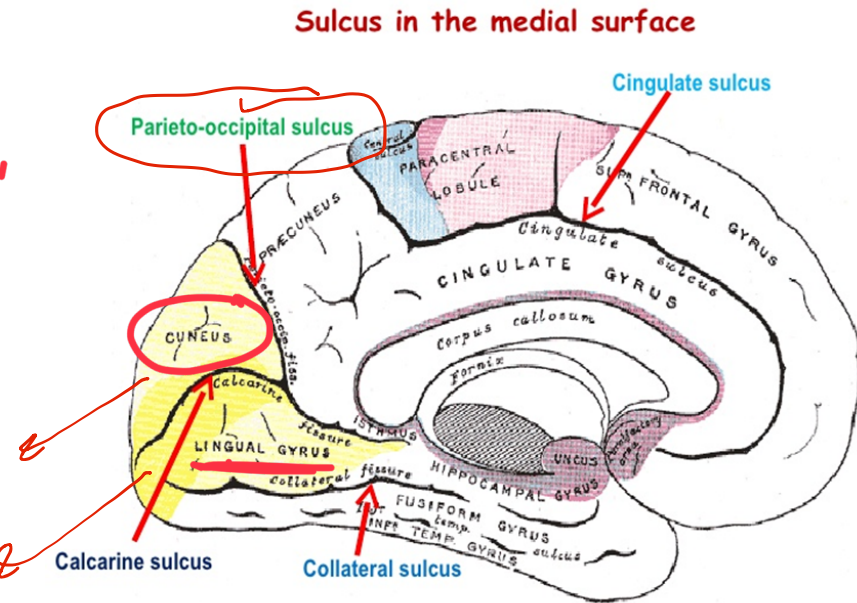
The Aphasia square



Occipital lobe

- Visual cortex, controlling contralateral visual field (contralateral hemianopia)
- Cuneus: lower quadrant (contralateral lower quadrantanopia)
- Lingual: upper quadrant (contralateral upper quadrantanopia)

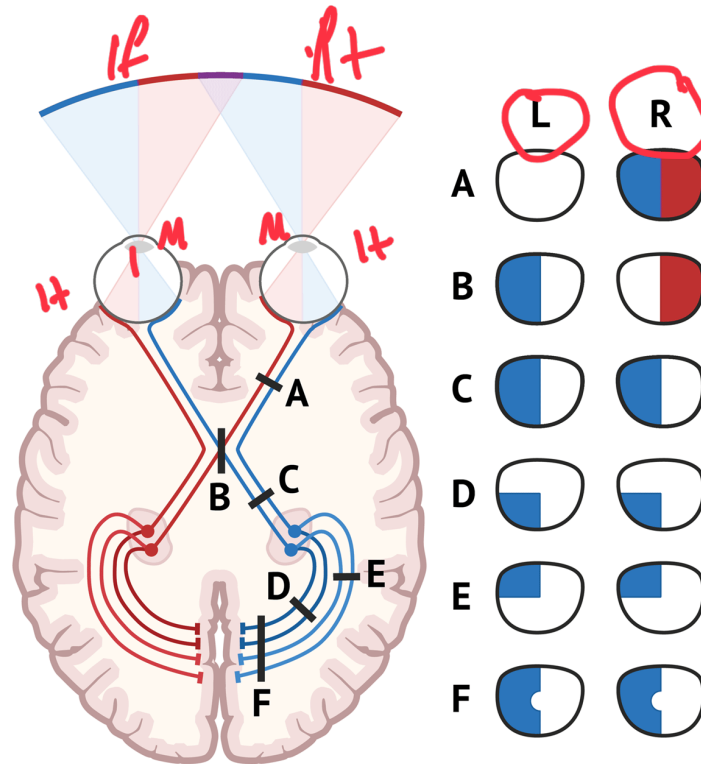
lower part
upper part



Visual pathway field defects

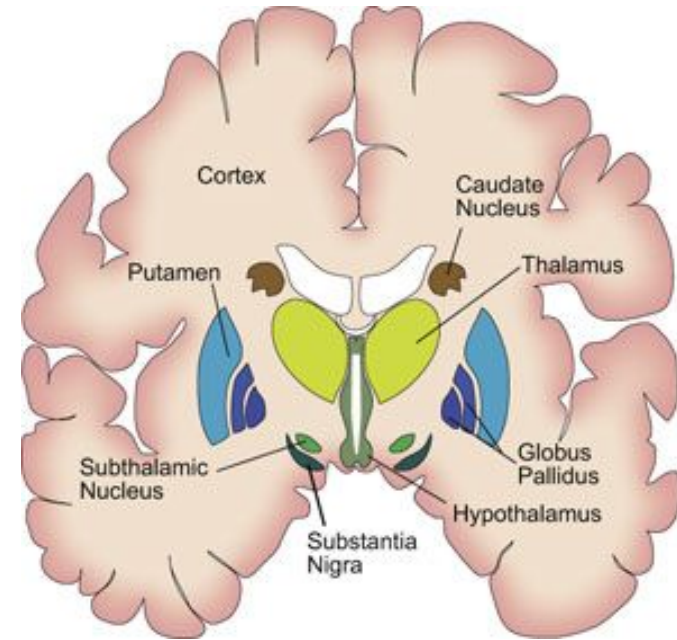


فقدان حيز البصر



Brain Basal Ganglia

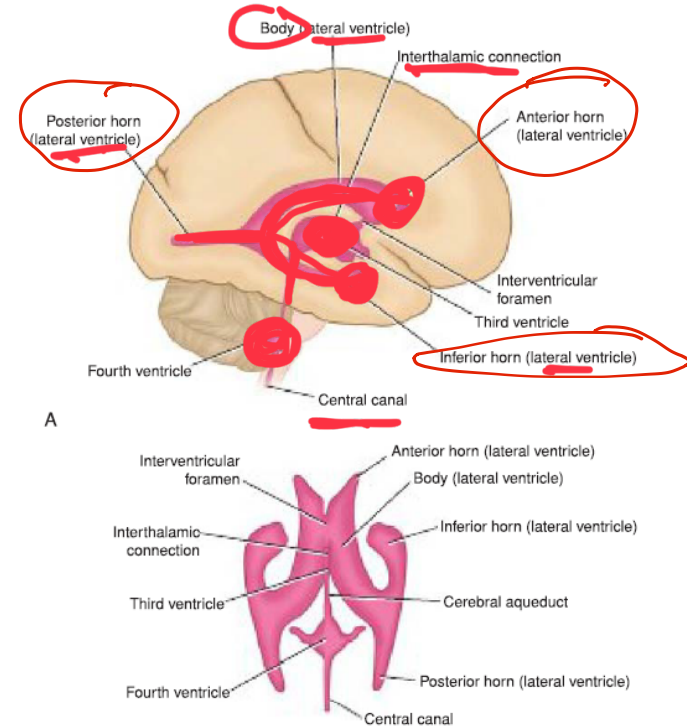
- A group of subcortical nuclei responsible primarily for motor control *neurons عصبونات*
- Caudate nucleus, putamen, and globus pallidus in the cerebrum
- Subthalamic nucleus in the diencephalon
- Substantia nigra in the midbrain



تجويف الدماغ فيه جدران جوفاء مثل دماغتي

Ventricular System

- 2 lateral ventricles
 - Interventricular foramina (of Monro)
- 3rd ventricle
 - Cerebral aqueduct (aqueduct of Sylvius)
- 4th ventricle
 - Central canal of the spinal cord
 - 3 foramina in its roof, with the subarachnoid space (2 Luschka, 1 Magendie)



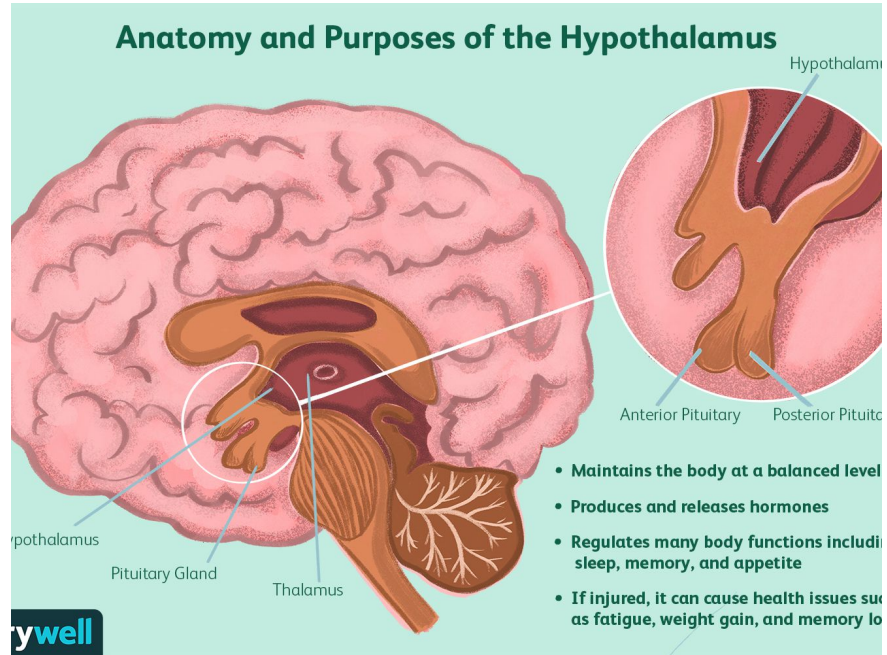
Thalamus

- Paired gray matter structure located near the center of the brain *3rd ventricle*
- It is above the midbrain, allowing for nerve fiber connections to the cerebral cortex in all directions (relay motor and sensory signals to the cerebral cortex)



Hypothalamus

- Small area located above the pituitary gland and below the thalamus & attached to the pituitary gland by a small stalk
- Releasing & controlling hormones
- Controlling appetite
- Managing sexual behavior
- Regulating body temperature
- Fluid and electrolyte balance, including thirst



جذع الدماغ

Brainstem

- Connects brain to spinal cord
- Contains cranial nerve nuclei III to XII

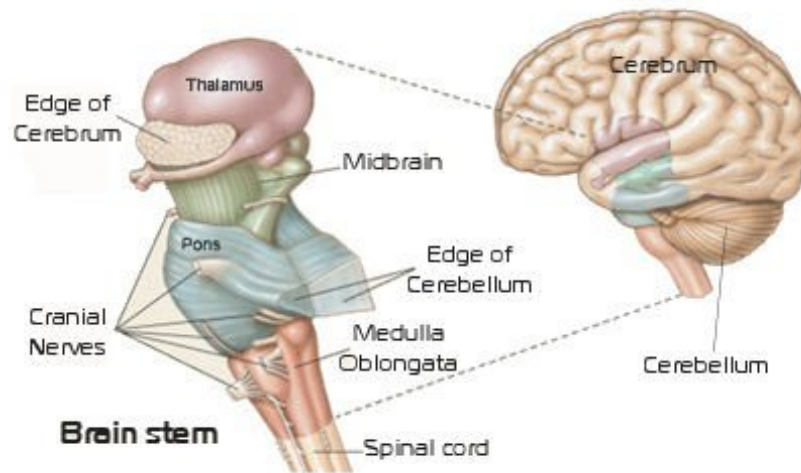
حاجرات ١، ٢، ٣

- Regulates respiration, cardiovascular function & consciousness

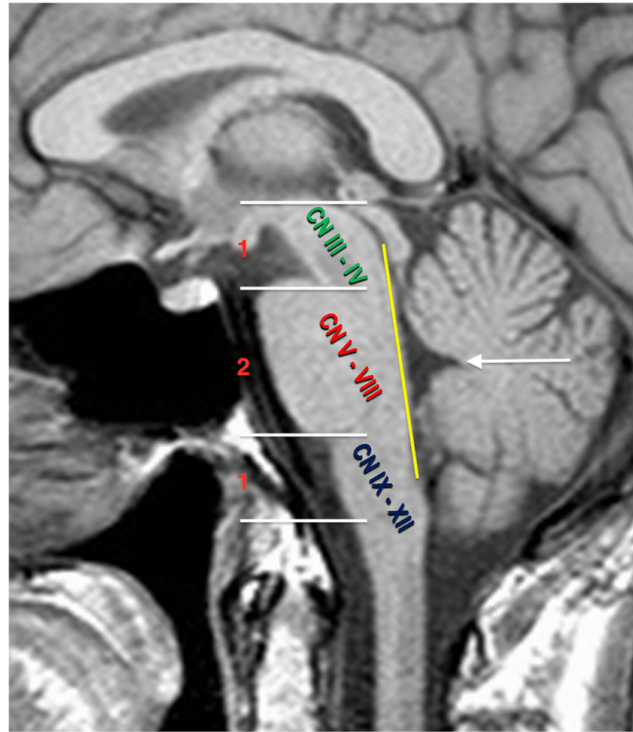
١. Midbrain 3 - 4

٢. Pons 5 - 8

٢. Medulla Oblongata 9 - 12



Brainstem



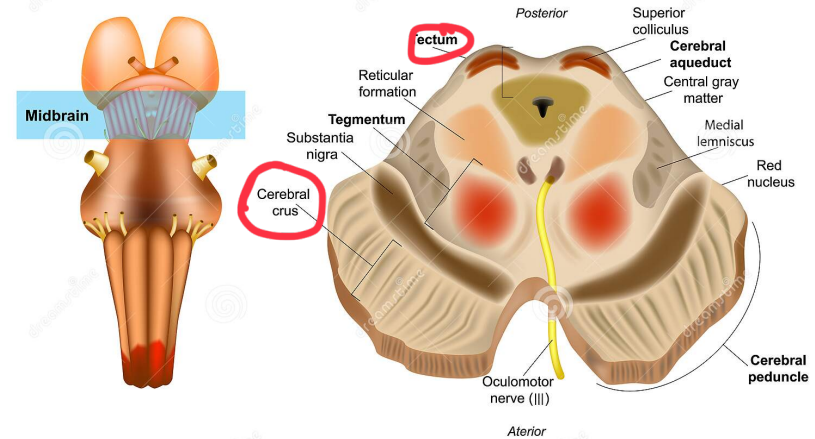
Midbrain

- III & IV CN
- 2 crus cerebri (pyramidal tracts)
- Quadrigenal plate (superior colliculi & inferior colliculi)
- Cerebral aqueduct

بنقل الحركية
جهاز التناسل motor

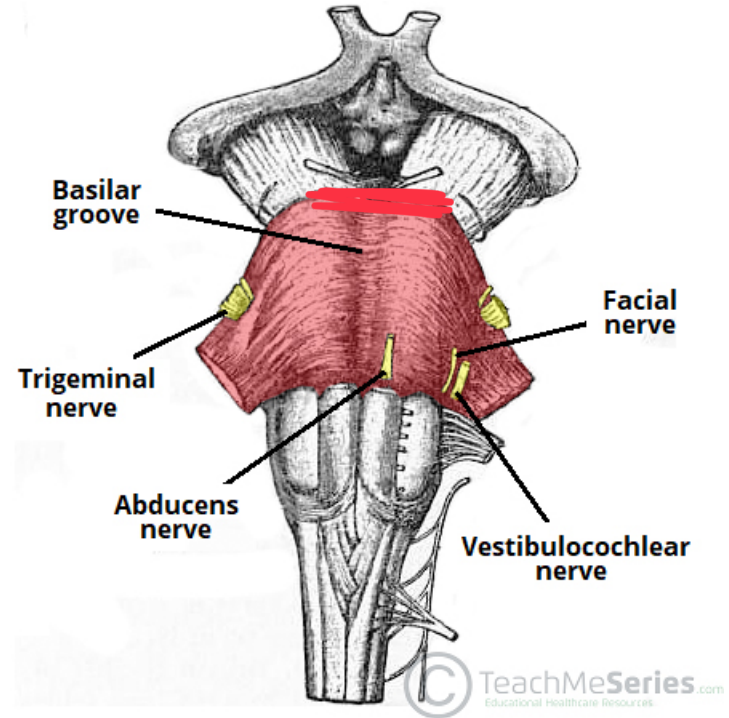
ventral part

Cross-section of the midbrain at the level of the superior colliculus



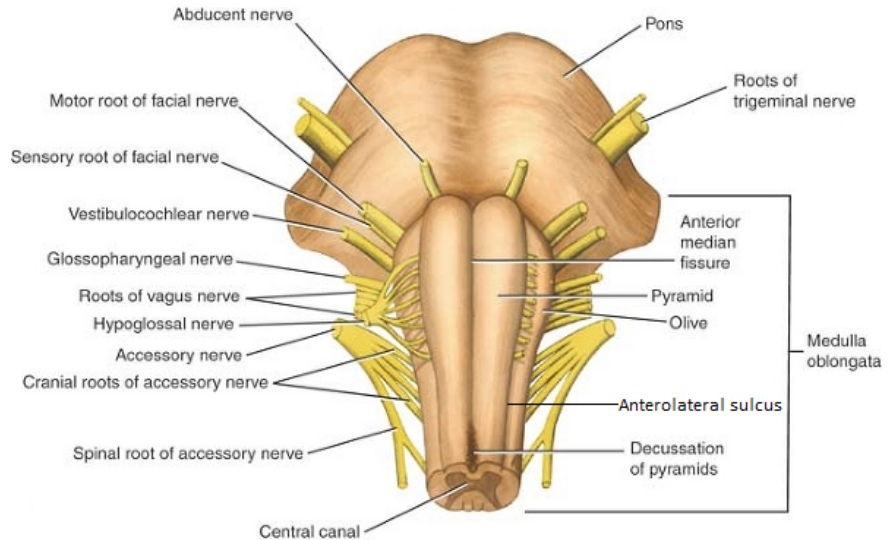
Pons

- V, VI, VII, VIII CN
- The posterior surface of the pons faces the cerebellum and forms the upper part of the floor of the fourth ventricle

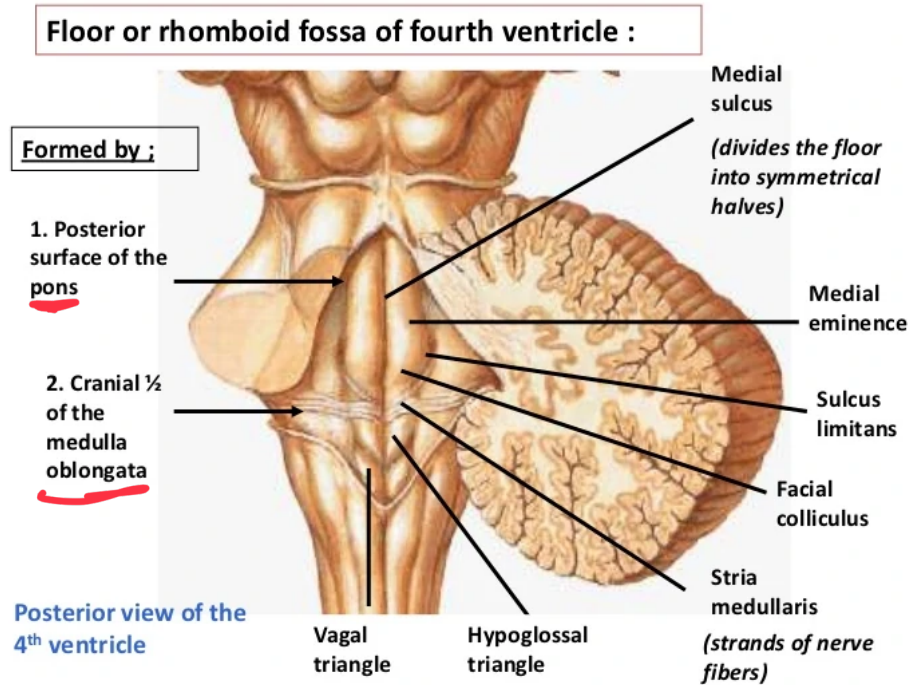


Medulla oblongata

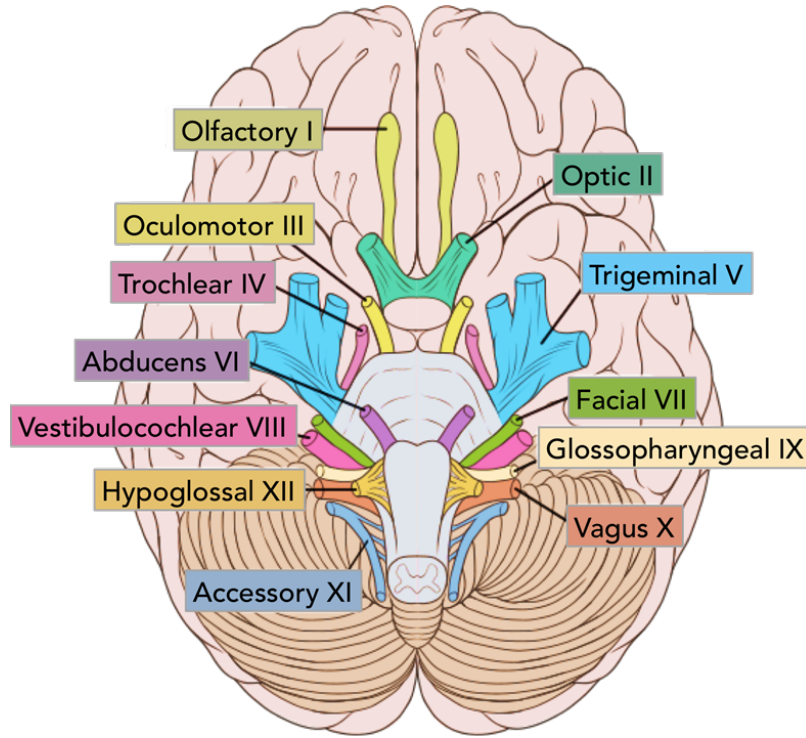
- Connects with the spinal cord at the level of the foramen magnum
- IX, X, XI, XII CN
- The posterior surface of the medulla faces the cerebellum and forms the lower part of the floor of the fourth ventricle



Floor of the 4th ventricle

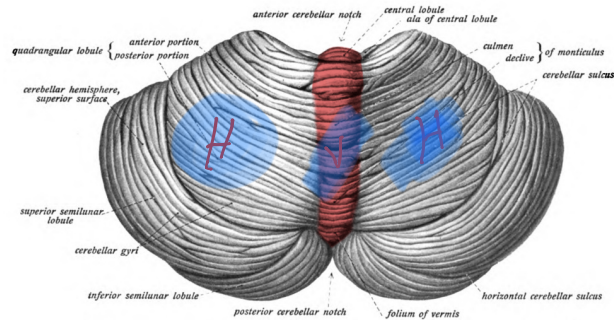
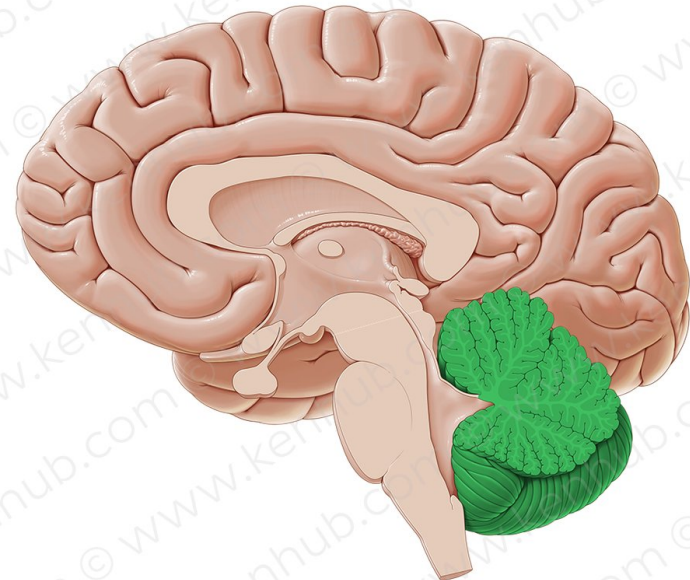


Cranial Nerves



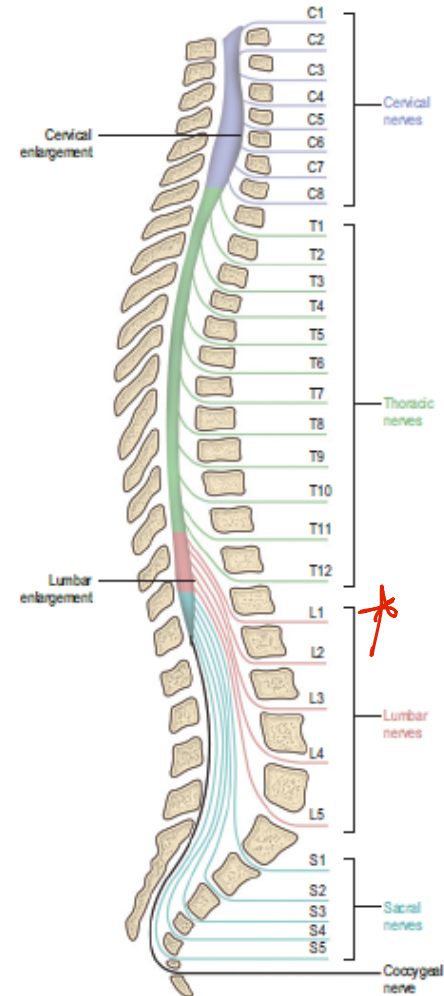
Cerebellum

- Located in the posterior fossa, infratentorial
- Main function: coordination of motor movement



Spinal cord

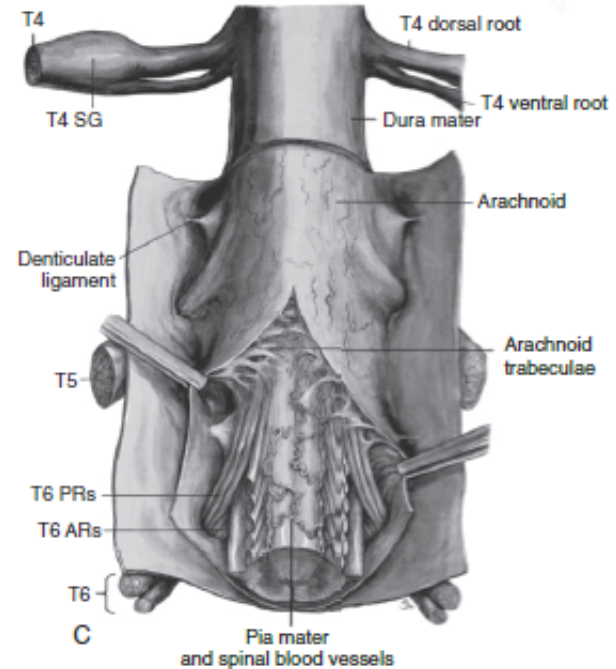
- Occupies the vertebral canal
- Extends from foramen magnum to L1-L2 level
- Cylindrical in shape
- Numerous ascending and descending axonal tracts
- Like the brain, it is surrounded by 3 concentric meninges (ending at S2)



Spinal cord

Denticulate ligaments

- A pia mater sheet
- Extends between the anterior and posterior roots
- Extend out through the arachnoid mater to attach onto the dura
- Anchor and position the spinal cord within the central area of the subarachnoid space.

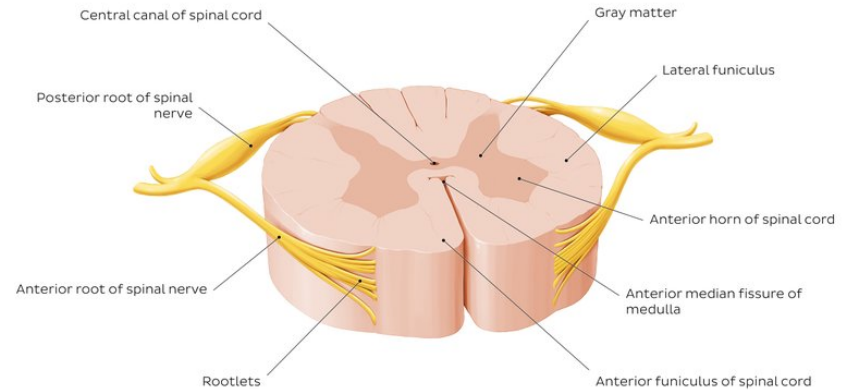


Spinal cord

Cross section

- Anterior median fissure
- Posterior median sulcus
- Posterolateral sulcus
- Posterior intermediate sulcus
- Outer white matter columns
- Inner H-shaped gray matter (horns)

Rootlets → Roots from each segment (anterior & posterior) → Spinal nerves (No. 31)

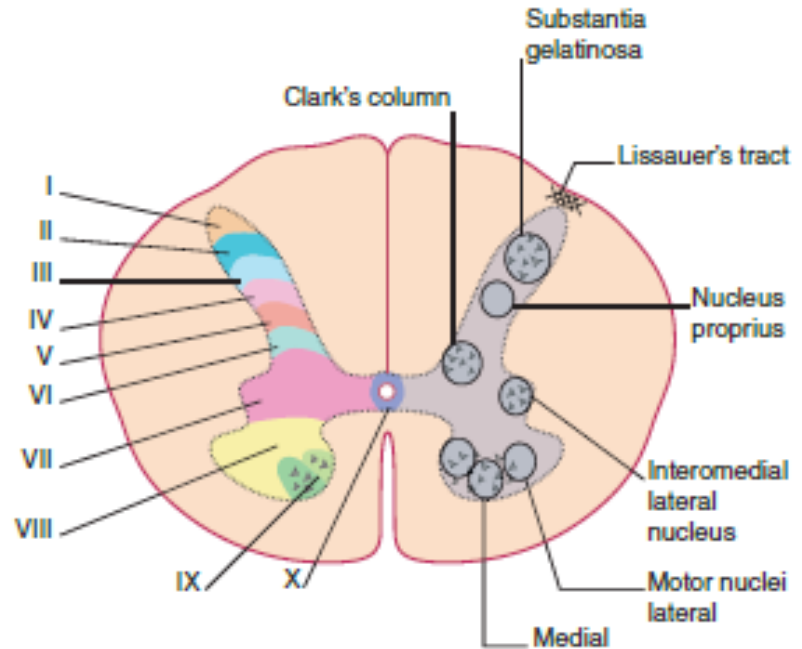


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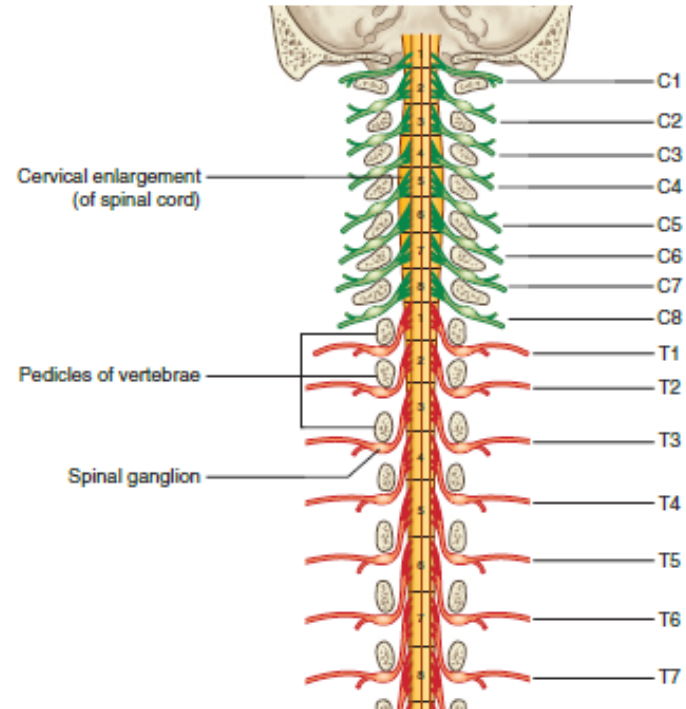
Spinal cord

- The grey matter is divided into 10 zones known as **Rexed's laminae**. The anterior horn contains motor neuron. The posterior horns, sensory.
- The **white matter**: The anterior funiculus (column) consists of motor axons, the posterior consists of sensory.



Spinal cord

- Spinal nerves exit above the corresponding vertebra in Cervical spine, but below it in thoracic & lower spine
- This is because we have 7 cervical vertebrae but 8 cervical cord segments



Spinal cord

Important tracts:

- Lateral corticospinal (Pyramidal) tract (↓ motor)
- Anterolateral/spinothalamic tract (↑ pain & t⁰) *sensory superficial*
- Posterior column–medial lemniscal pathway (↑ conscious proprioception, vibration, and discriminative touch)

deep sensory

