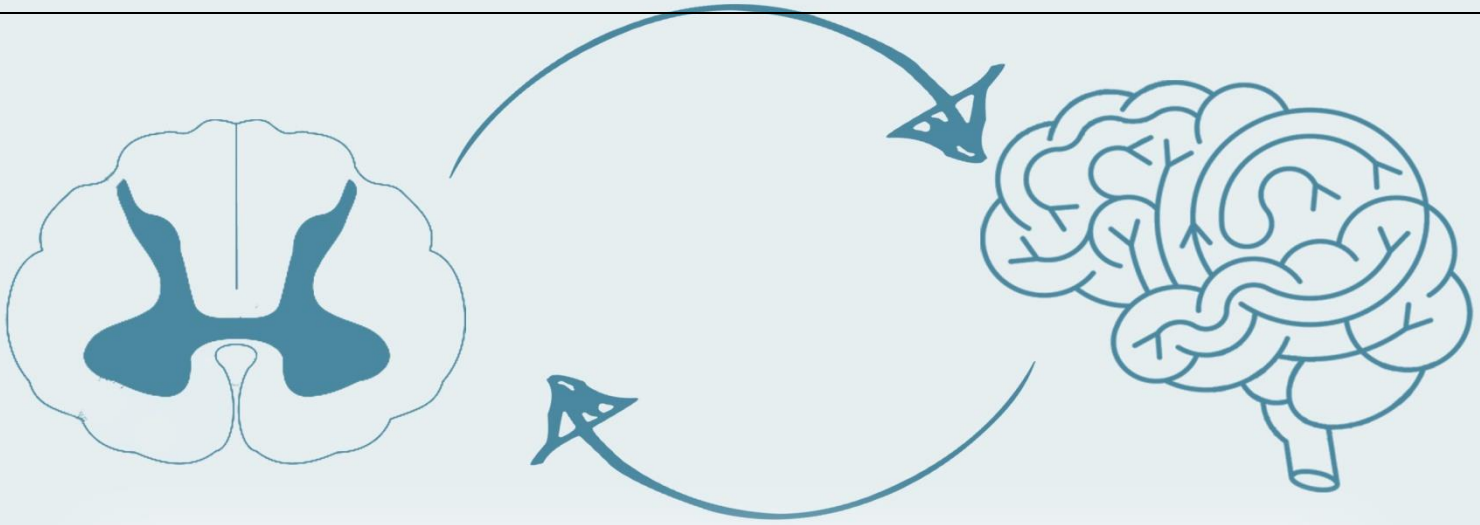

CNS

Anatomy Lab

0 slides 0 sheets

number	Lab #1
Done by	Maram Al-Samee and Mariam Hassouneh
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Doctor	Dr.Maha El-Beltagy

IN THIS PART WE WILL DISCUSS THE SPINAL CORD, ASCENDING AND DESCENDING TRACTS.

I HOPE YOU ENJOY THIS SMOOTH EASY SHEET ☺

The spinal cord: Is long, thin, conical in shape – in the longitudinal section- that extends from the level of foramen magnum as a continuation of the medulla oblongata and ends at the level of L1-L2 intervertebral disc; its lower end is the **CONUS MEDULLARIS**.(Figure 1)

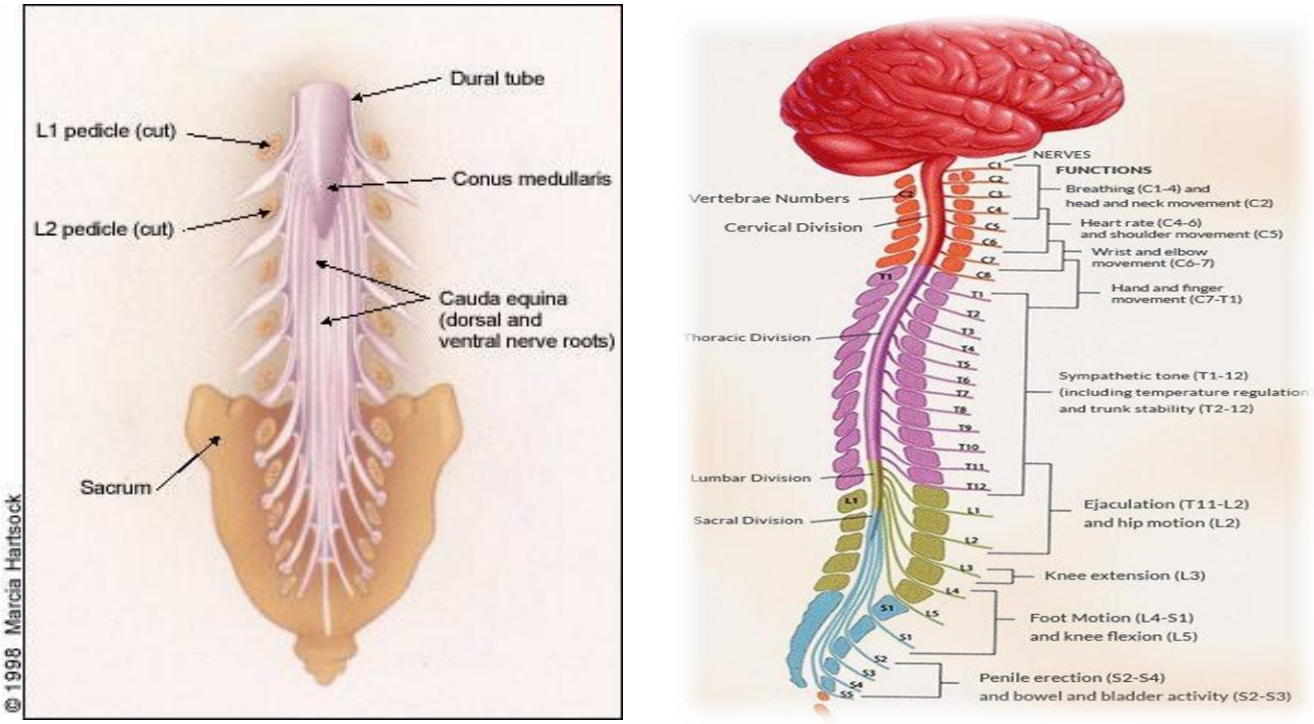


Figure 1: Left, Spinal cord termination; Right, the spinal cord segments

-It has 31 segments (8 cervical, 12 thoracic, 5 lumber, 5 sacral, 1 coccygeal).

-The growth of the vertebrae exceeds the growth of the segments, so each segment is 2 levels after the corresponding vertebra.

-How can we know the number of spinal segment?

By a simple equation that helps localize the lesions related to the spinal cord for the clinical examination and the manifestations which is resulted from the **(4Ts)** that affect the spinal cord (**T**umour, **T**rauma, **T**hrombus and **T**oxins)

The equation is:

C+X = the segment >> (C is the number of the vertebra)

Rule	# of vertebra	# of segment
In the cervical region >> (C+1)	C7	C 8 (So segment 8 is corresponding to the 7th cervical vertebra)
upper thoracic region (T1-T6) >> (T+2)	T5	T7
lower thoracic region (T7- T9) >> (T+3)	T8	T11
----	T10	L1/L2
----	T11	L3/L4
	T12	L5
----	L1	all the sacral segments

The spinal cord has 3 coverings and 3 spaces (Figure2):

- The coverings "from inside to outside":
  1- **Pia matter**: Which has *modifications* that allow the fixation of the spinal cord.

  A. *Denticulate ligament*: It extends and pierces the upper layers and fixed the spinal cord to the Dura and the bonny part opposite to the Dura.

  B. *Filum terminale*: Extension of the pia matter that anchors spinal cord to coccyx.

  2- **Arachnoid matter**.

  3- **Dura matter**.

- <u>The spaces:</u>

  a. Subarachnoid space: between the pia matter and the arachnoid matter containing CSF and continues" with the subarachnoid space around the brain.

  b. Subdural space: between the dura and arachnoid.

  c. Epidural space : is an <u>anatomic space</u> that is the outermost part of the <u>spinal canal</u>. It is the space within the canal, lying outside the <u>dura mater</u>, where the anaesthesia is injected.

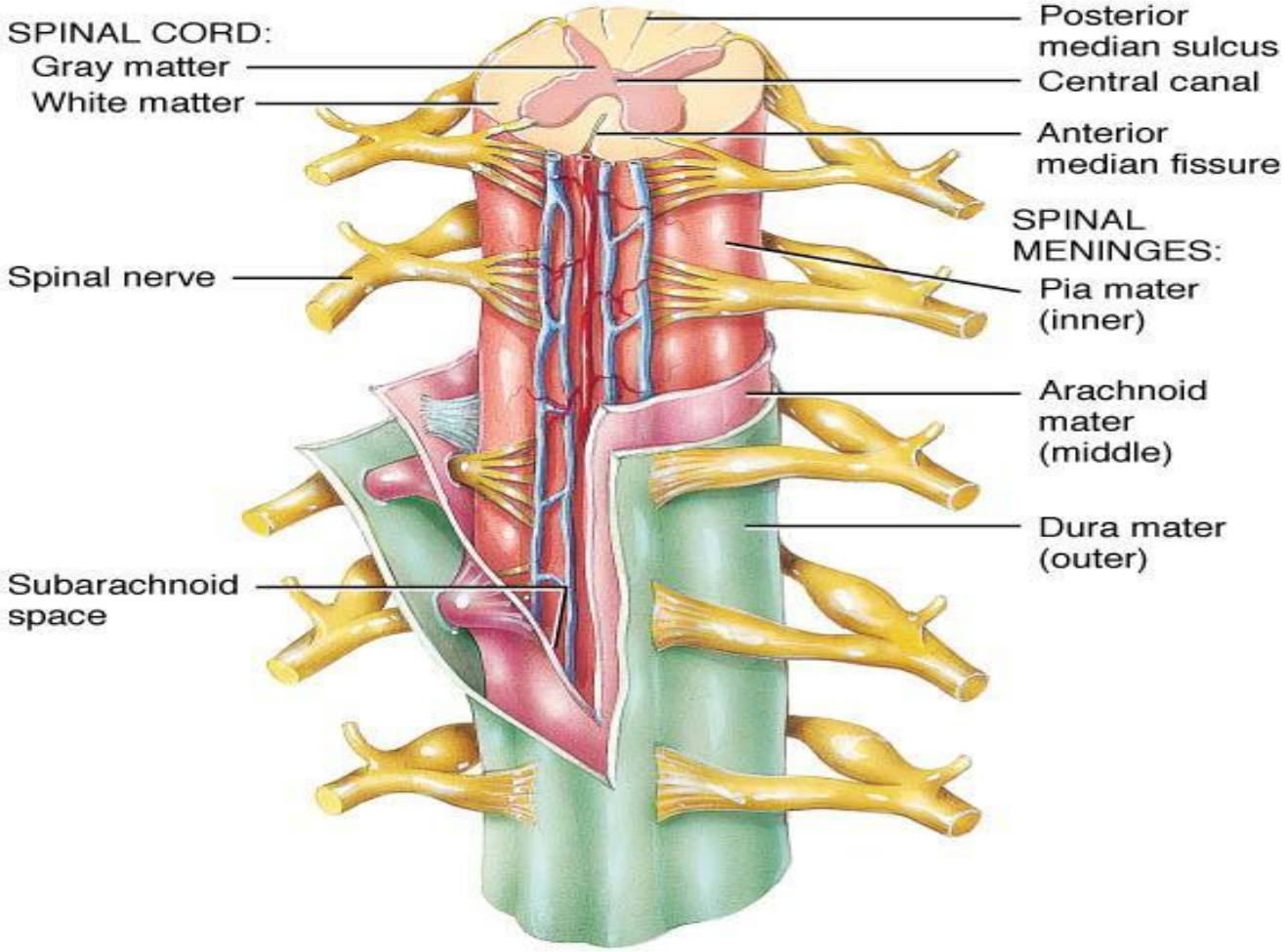


Figure 2: Anterior view and transverse section through spinal cord

-The CSF is found inside the spinal cord and outside brain.

- Inside the spinal cord in the central canal, it expands into the fusiform terminal ventricle (mentioned again later) that terminates below within the root of the filum terminale. It is filled with cerebrospinal fluid and is lined with ciliated columnar epithelium, the ependyma. Thus, the central canal is closed inferiorly and opened superiorly into the fourth ventricle.

- At the level of **S2** vertebra, **Meninges** (Pia, arachnoid, Dura) **and their spaces END**, except the Filum terminale which starts from conus medullaris and end at the coccyx.

Ventricles of the brain:

1. **2 Lateral ventricles :**
   Inside the right and left cerebral hemispheres, we can see them through a cross section in the brain; they appear as a space extending in the front and inferiorly.
   - The 2 lateral ventricles communicate with the Third Ventricle, which appears as a slit between the 2 cerebral hemisphere lined by ependymal cells (between the 2 thalami)

2. If we remove the Falx Cerebri (a large, crescent-shaped fold of meningeal layer of Dura mater that descends vertically in the longitudinal fissure between the cerebral hemispheres of the human brain) we will **not see** the 3rd ventricle, why ?!
   Due to the presence of a connection between the 2 hemispheres called the **Corpus Callosum** which is the **roof** of the 3rd vent.

- *Boundaries of the 3rd vent.(Figure 3):*

  Above >> Corpus Callosum
  Lateral >> The Diencephalon (the thalamus and it related structures (subthalamus, metathalamus...etc.)
  For this reason the 3rd ventricle is called "the ventricle of diencephalon"!
  Medial >> No boundary (it's a closed circle from all parts except the lower part)
  Below >> Opens to the cerebral aqueduct.

3. ***The 4th vent***. :
   A rhomboid مَعِين shape between midbrain, pons, and medulla anteriorly and the cerebellum posteriorly, filled with CSF.
   THERE is a canal that connect the 3rd to the 4th ventricle called Cerebral aqueduct of sylvius.
4. ***Cerebral aqueduct of sylvius***
   The narrowest canal in the CNS, so obstruction is common, and it leads to accumulation of the CSF above the level of obstruction.
   If the obstruction is great, more CSF will accumulate in the lateral vent. making hydrocephalus (a condition in which there is an accumulation of cerebrospinal fluid (CSF) within the brain; This typically causes increased pressure inside the skull.)

- What is the point of communication between the 3rd vent. and the lateral ventricles ?

A foramen in front of the thalamus called inter-ventricular foramen "Foramen of Monro"

CSF from the lateral ventricles goes to >> the 3rd vent. then to >> the 4th ventricle through the cerebral aqueduct, finally to the central canal of spinal cord which in its lower part forms a dilation called the **terminal ventricle**.

- There are 3 communications between the 4th ventricle and the subarachnoid space through the lateral and median apertures; The median aperture is called Foramen of Magendie, and the 2 lateral apertures are called foramen Luschka.

There are 3 peduncles between the brainstem and the cerebellum (mentioned again in details in part B of the lab):

1. Superior cerebellar peduncle, connects the mid brain to the cerebellum
2. Middle cerebellar peduncle, connects pons to the cerebellum (horizontal more superficial)
3. Inferior cerebellar peduncle, connects the medulla to the cerebellum

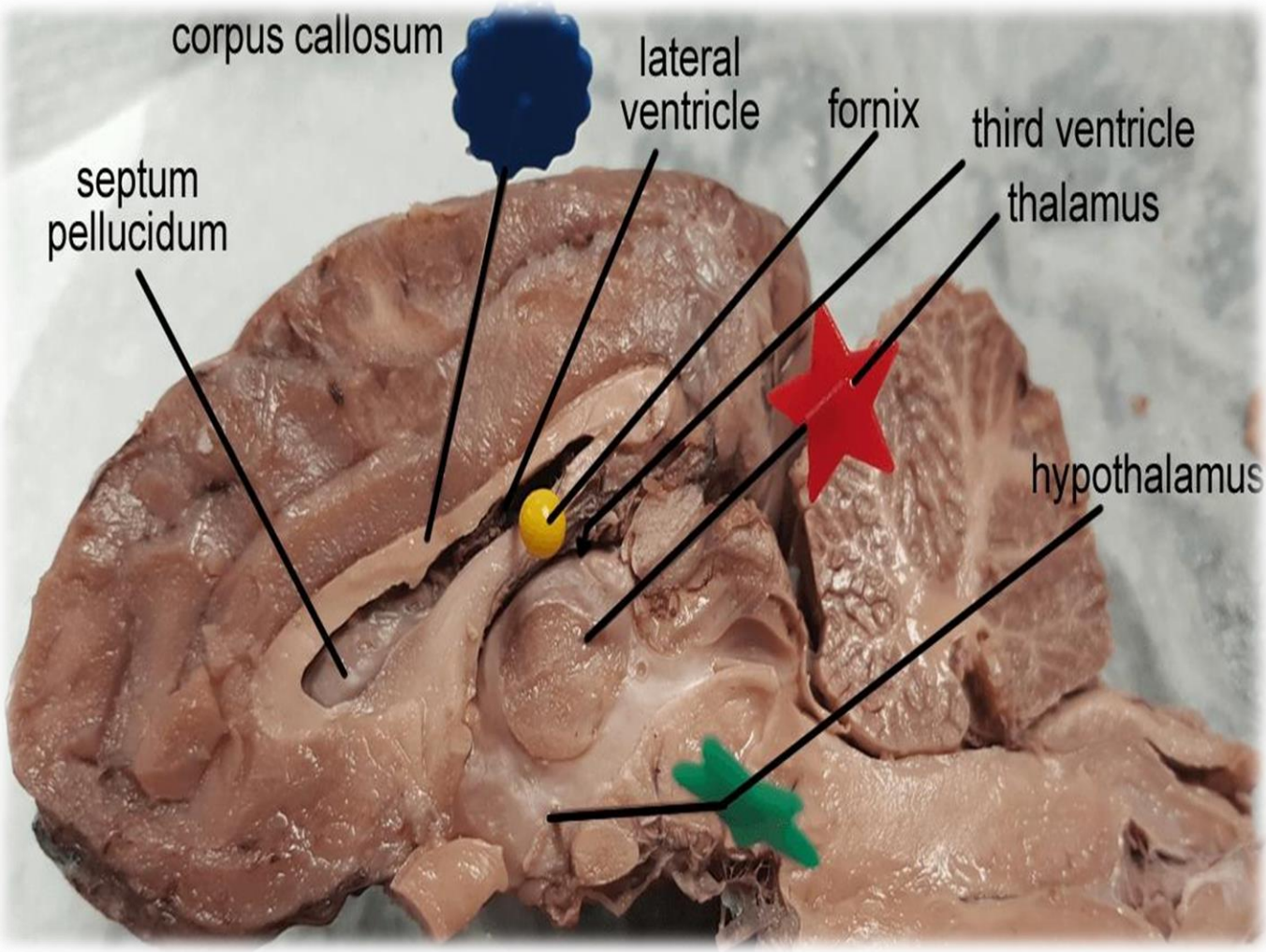


Figure 3: Mid-Sagittal section showing the medial surface of the brain

Spinal cord's Subarachnoid cisterna:

It is a swelling which is filled with CSF where Lumber puncture is performed in the spinal cord. CSF in normal person is transparent; turbidity العكر indicates infection, and blood indicates subarachnoid haemorrhage.
Also anaesthesia is injected here; it also can be injected in the epidural space.

Thalamus: It is the largest relay station in the brain; all the sensations except the olfaction must have an interpretation or a relay inside the thalamus. The thalamus appears bluish in color due to CSF surrounding it. (Figure 4)

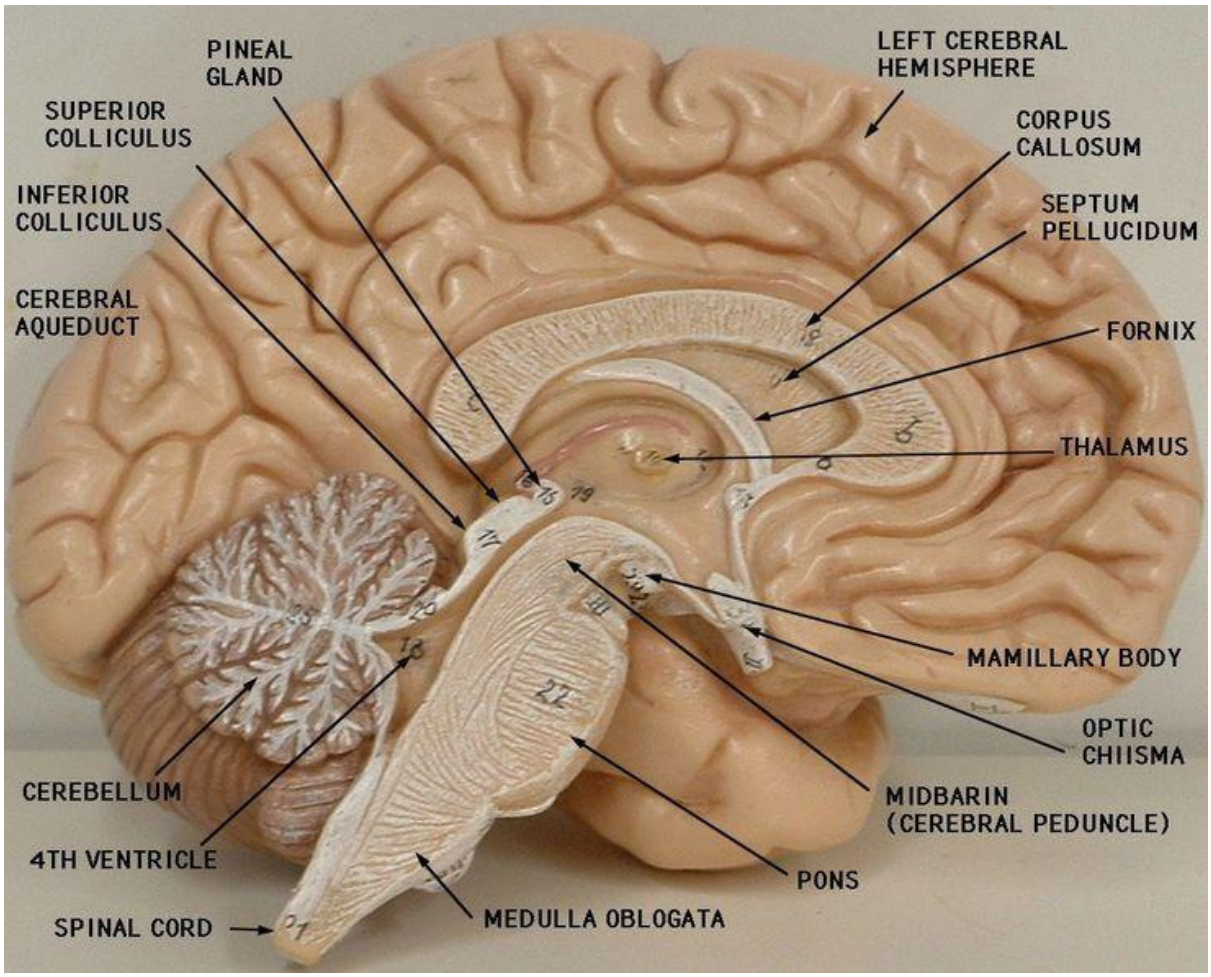


Figure 4: Mid-Sagittal section in the brain and brain stem "plastinated"

Tracts of the spinal cord:

Between right and left anterior column, there is the anterior white commissure (a bundle of nerve fibres which cross the midline of the spinal cord just anterior (in front of) to the gray commissure), But in the posterior white mater there is no commissure because the posterior median fissure reach the septum.

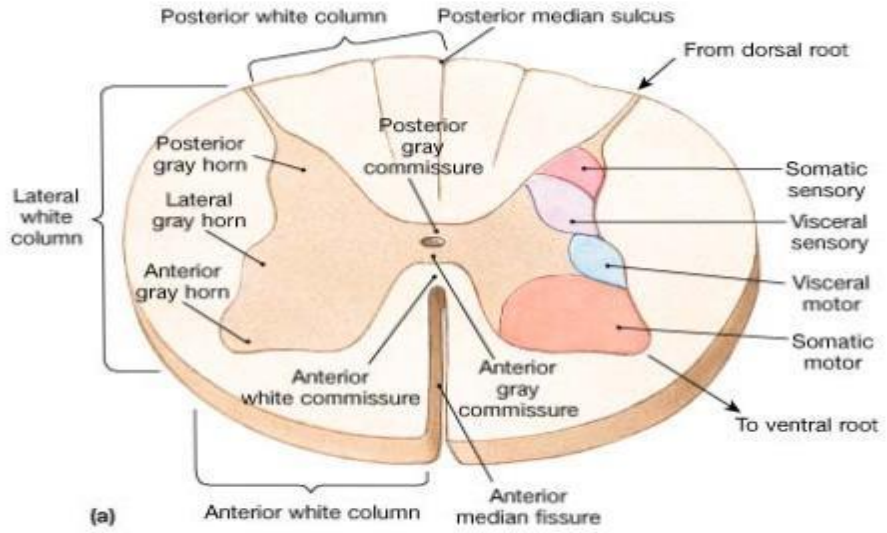


Figure 5: A Spinal segment; Tracts of the spinal cord

Also there are 2 communication in front and posterior to the central canal which are called the anterior and posterior grey commissure, connecting the left and right side of the spinal cord.

Tracts are divided into anterior, posterior and lateral columns.

1. Ascending tracts

** ***Tracts reaching the cortex:***

a. Posterior column medial lemniscus >> carrying conscious proprioception, 2 point discriminative touch and vibration.
b. Anterior and posterior Spinocerebellar tract.>> unconscious proprioception
c. Lateral spinothalamic >> pain and temperature
d. Anterior spinothalamic >> crude touch and pressure

** ***Tracts reaching the brain stem:***

a. Spinotectal

It reach the tectum of mid brain (posterior part of the midbrain compose of 2 superior colliculus and 2 inferior colliculus).

The tectum is responsible for mediating the visual and auditory reflexes.

b. Spinoolivary

It reaches the olive, the anterolateral surface of medulla oblongata
Compose of inferior and superior olivary nucleus.
These both are found at the junction of the lateral with the anterior column and they are overlapping.

- How to differentiate between the 2 types of touch in examination?

Fine touch by a needle or compass, while Crude touch by a cotton.

- What's the difference between the tract and lemniscus?

Fibers of neurons in the spinal cord are called tract, in the medulla they become lemniscus.

- What are the lemnisci?!

a. Medial lemniscus
b. Lateral lemniscus
c. Spinal lemniscus
d. Trigeminal lemniscus

2. Major 2 Descending Tracts:

a. Pyramidal tracts:

They must be originating from one area (area 4 in the precentral gyrus), **contribution also from area 6 (40%) and somatosensory area (20%),** and go through the pyramid which is found in the medulla oblongata.

Pathway :

Area 4 >> internal capsule >> brain stem >> mid brain in the cerebral peduncle (part of the cerebral peduncle is the crus cerebri through which the pyramidal tract descend) >> pons >> medulla through the pyramid

They are 2 types:

1) Anterior or direct tract >> anterior corticospinal
2) Indirect pyramidal >> lateral corticospinal

b. Extrapyramidal tracts

1) Rubrospinal : Red nucleus>> lateral column
2) Reticulospinal ; *2 types :*
    - Medial or pontoreticulospinal
    - Lateral or medullary reticulospinal
3) Vestibulospinal
4) Olivospinal
5) Tectospinal

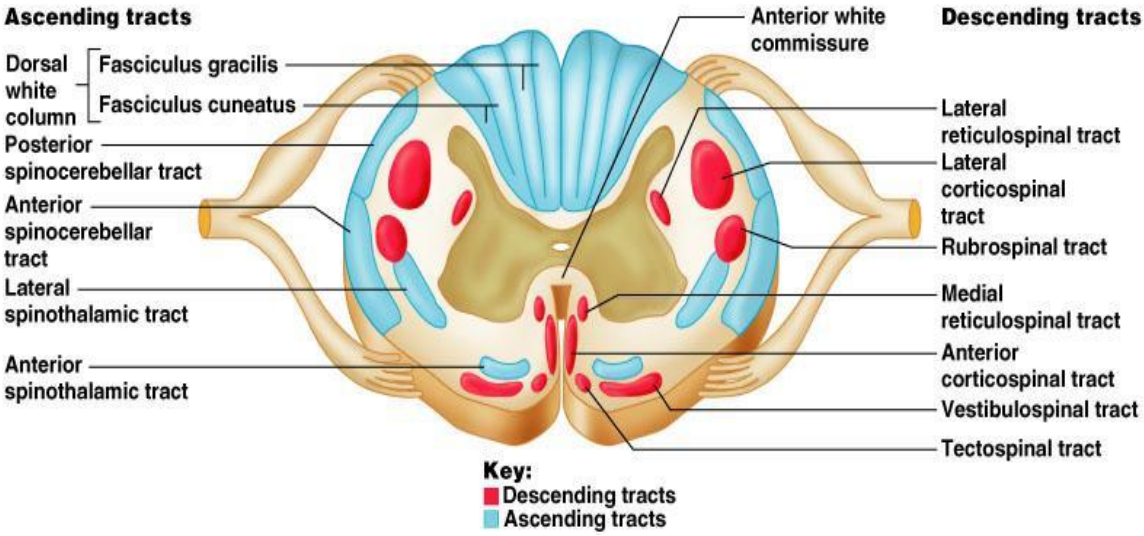
** Doctor said that the most important thing is to know the distribution of the motor and sensory pathways in the white columns.

Grey matter lamination

- Lamina 1 >> septomarginal > pain and temperature
- Lamina 2 >> substantia gelatinosa > pain and temperature
- Laminae 3&4 >> nucleus proprius
- Lamina 7 >> Clark's nucleus
- Lamina 8 >> motor>> in the medial side and anterior horn cell
- Lamina 9>> motor > in the lateral part of anterior horn cells

- Lamina 10 >> in the centre in the grey commissure
- Intersegmental tract:Has an important effect in mediating the spinal reflexes.
- Lissesaur's tracts: short ascending and descending (1 or 2 segments) that conveys to SGR (Lamina2) for pain and temperature perception.

Figure 6: Ascending and descending tracts of the spinal cord



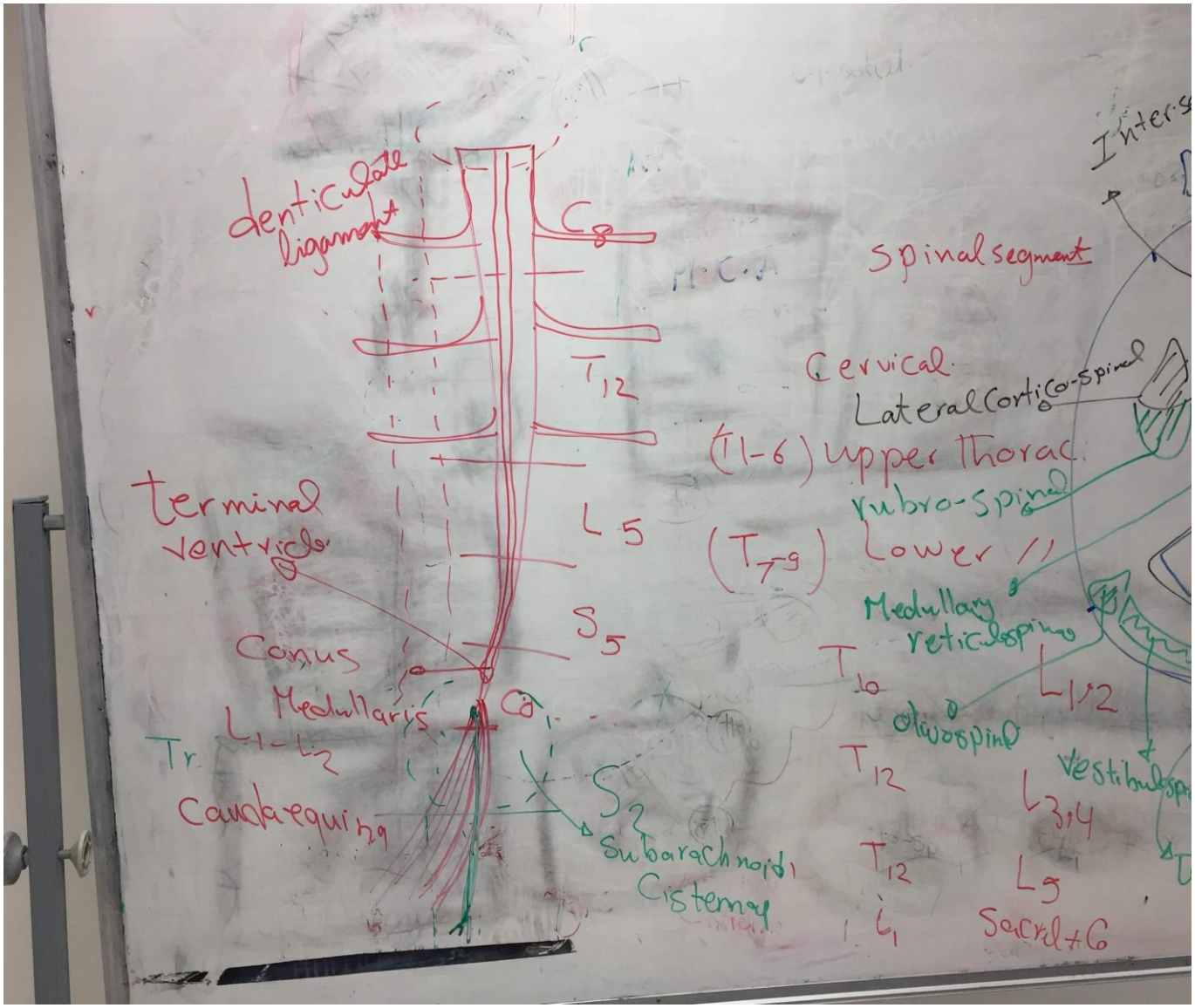


Figure 7: Spinal cord; Lab drawing

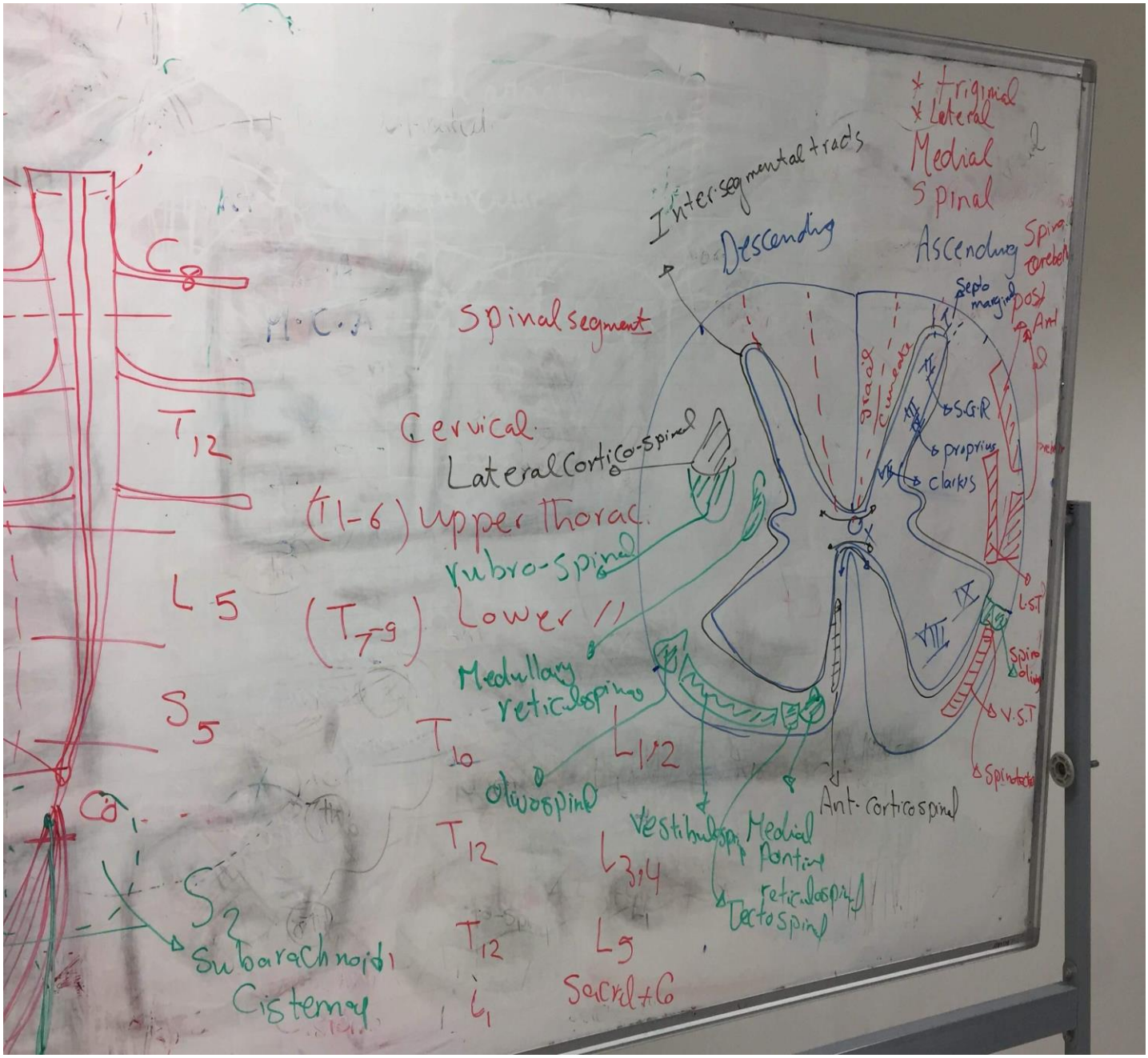


Figure 8: Spinal segment; Lab drawing

I might only have one match
But I can make an explosion…

NOW COMING TO PART B OF THE LAB, this part's record is on the batch channel and is named "A.lab1.2". Welcome and have fun :D!

To warm up, let's tell you what we'll discuss. We'll get to know the brain stem; the base of the brain view and arterial supply related to that view; as well as connections between both cerebrum and cerebellum with the brain stem "The peduncles"; and lastly we'll talk about cranial nerves' emergence from the brain and brain stem.

The brain; Wonders inferiorly!

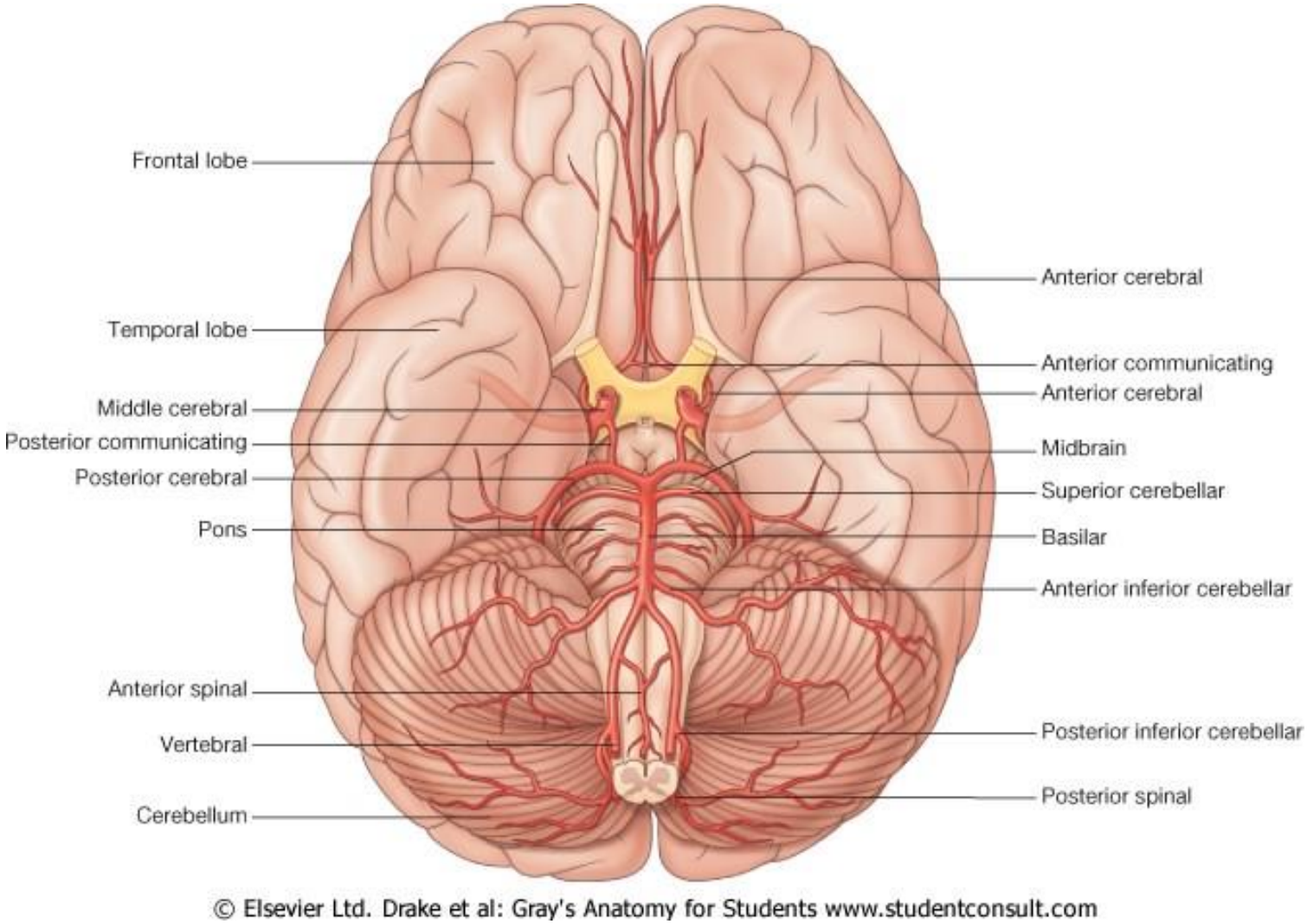


Figure 1: inferior view of the brain and arterial supply to the cerebral hemispheres;

Shown also is the ventral surface of the brain stem

When looking at the inferior part of the brain "when you flip the brain upside down", you will be able to study:

1. The inferior part of the brain "figure 2" which will be discussed more in the next lab.

Briefly: It's separated by a thing called "the stem of lateral fissure" into orbital and tentorial parts. The orbital part lies down on the orbital plate of frontal bone, while the occipital part is separated from the cerebellum by tentorium cerebelli (Figure 3).

2. The arterial supply to the brain, and the famous circle of Willis that has the Most magnificent and major role in saving the brain from ischemia in case a supplying artery got injured by **guaranteeing existence of other supplying Arteries that can function instead.**

3. The Ventral أمامي surface of the brainstem; Connections between cerebrum and brain stem, and between cerebellum and brain stem. These connections are called peduncles, which are actually tracts of white matter, carrying fibers from the cerebrum to deliver it to the cerebellum.

4. Cranial nerves emergence **"Most important".** First 2 cranial nerves "C I: Olfactory, and C II: Optic" emerge from the forebrain and stay there in brain area. Then nerves from 3 to 12 emerge from the brain stem at different levels.

5. Structures and spaces in the base of the brain and brain stem.

Being provided with these glimpses of info, we hope you'll find figures below as beautiful, amusing, educating and meaningful as they can be!

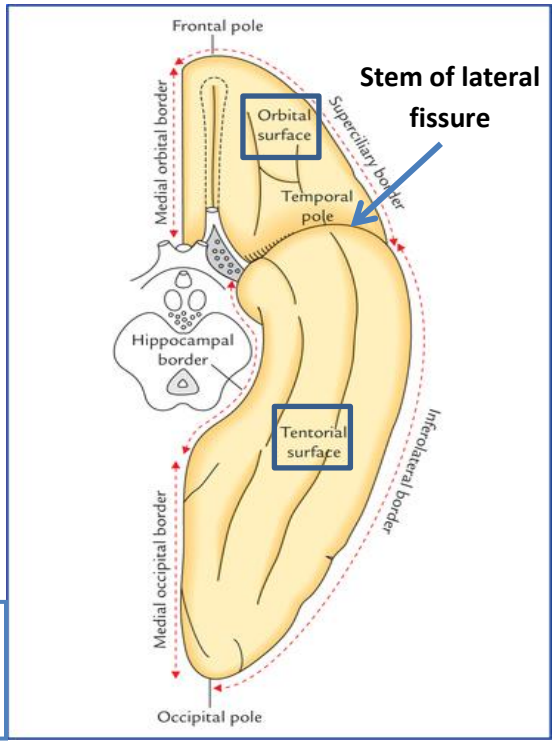


Figure 2: Inferior view of the brain.

We'll see this again in the next lab!

Back in memories to MSS, there was a fold of dura mater named “Tentorium cerebelli; tentorium means like a tent خيمة”, its function was to separate cerebrum “brain” from cerebellum.

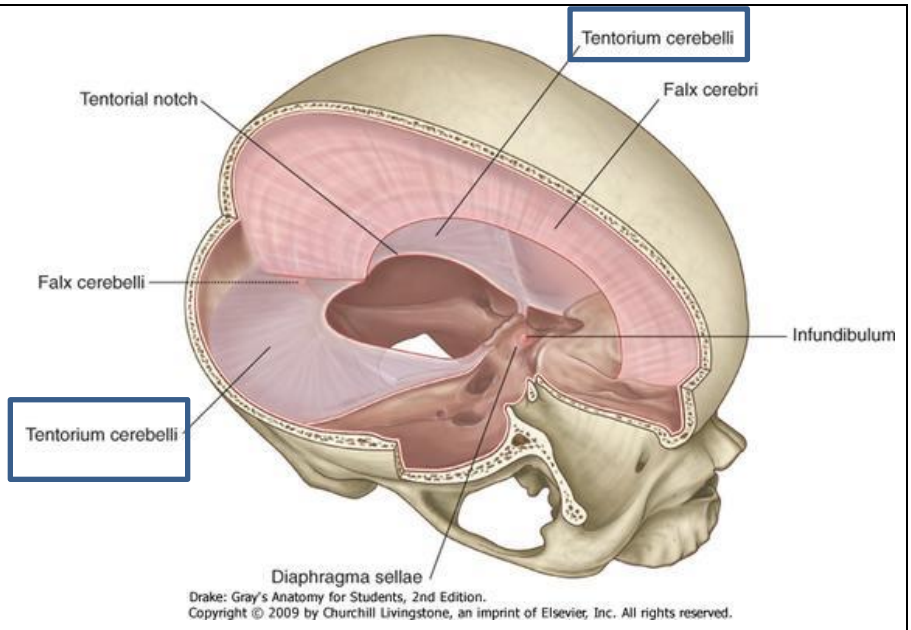


Figure 3: Dura matter folds in the brain

Anterior to the cerebellum we’ll find the brain stem.

The brain stem is of 3 parts; superior to inferior:

1. Mid brain. Its ventral surface is what we call the **BASE OF THE BAIN!**

2. Pons “pons; a bridge, any tissue which bridges across some space or structure. Specifically, the bridge-like mass of nerve cells and fibers on the anterior aspect of the brain stem between the cerebral peduncles and midbrain *cranially* في الأعلى, and the medulla oblongata *caudally* في الأسفل ”

3. Medulla Oblongata “elongated marrow النخاع المستطيل”

- Connections between:

1. **The Midbrain and cerebrum (Figure 4, 8)**. This connection is called Cerebral peduncle” peduncle; stalk or stem ساق”. Cerebral Peduncles which are 2 in number, one on each side, represent tracts (axons in the CNS) that descend from the cortex to the midbrain. These peduncles appear as 7 in Arabic “٧”, and they connect inferior of the brain to the midbrain.

2. **Cerebellum and Brain stem** “Cerebellar peduncles”. We have 6 cerebellar peduncles, 3 on each side (Figure 5):

A. Superior 2 on each side connecting the midbrain to the cerebellum “Superior cerebellar peduncle”.

B. Middle 2 on each side connecting the pons to the cerebellum “Middle cerebellar peduncle”.

C. Inferior 2 on each side connecting medulla oblongata to the cerebellum “Inferior cerebellar peduncle”.

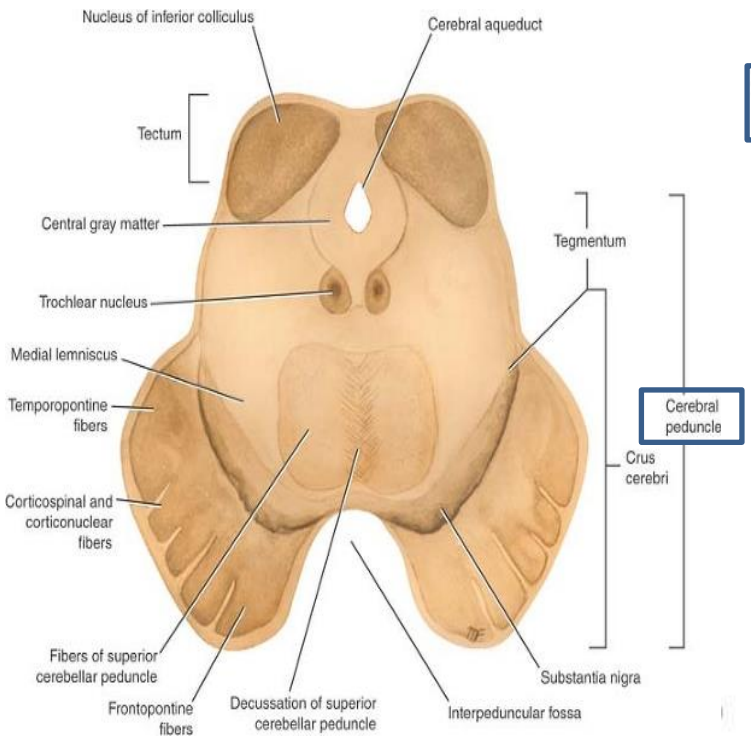


Figure 4: Cerebral Peduncle; X-Section in the Midbrain

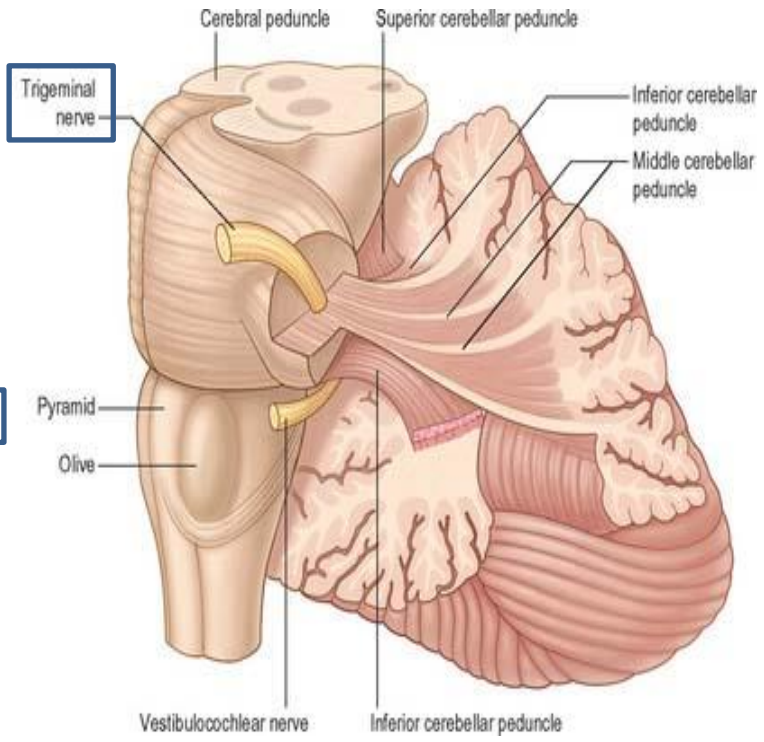


Figure 5: Cerebellar Peduncles; lateral view

- We can clearly observe the following:

1. That the cerebellar peduncles do not tightly stick the brainstem to the cerebellum, they leave spaces between the brain stem and cerebellum, and this gave the green card for a cavity to be formed, which we'll name **"the fourth ventricle".** The roof of the 4th ventricle is the cerebellum while the floor is the brain stem. Also, this Tent-like ventricle is connected upward to the 3rd ventricle – through cerebral Aqueduct- while downward it's connected to the central canal of the spinal cord (figure 6; ventricles of the brain), when we collect all these puzzle parts we can clearly affirm that in this ventricle we can find **CSF!**

2. That the cerebellar peduncles are not aligned above each other in the same plane; you can see that middle cerebellar peduncle is above the superior and inferior (figure 7; posterior view of the brain stem).

3. ***Later on***; when you see the **posterior** view of the brain stem, you'll notice that the Back of PONS and the Back of UPPER part of medulla oblongata are the ones forming the FLOOR of the **4th ventricle**. Also you'll see the Tectum "Tectum; a roof or cover" which is the posterior part of the MIDBRAIN. "Remember that the Ant. Part was called Tegmentum (Tegmentum, a covering; a term applied to the part of the midbrain between the cerebral peduncles ventrally and the tectum - Quadrigeminal bodies – dorsally)."

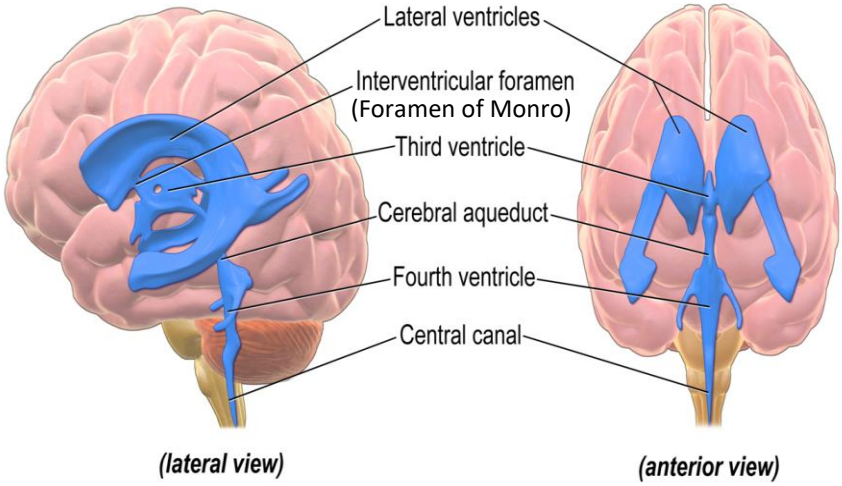


Figure 6: ventricles of the brain

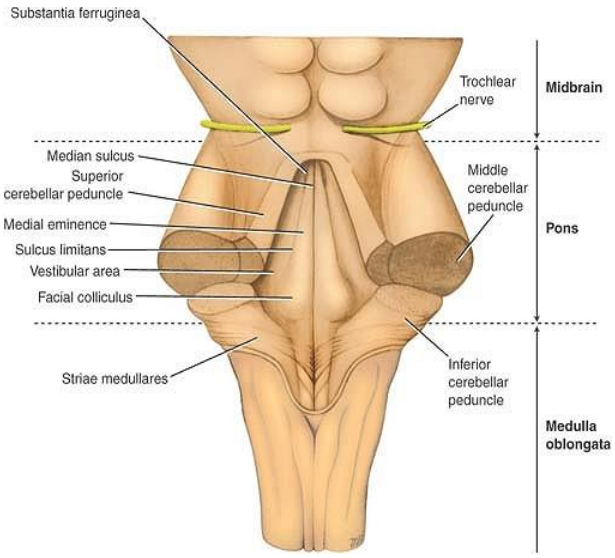


Figure 7: posterior view of brain stem

Brain stem

1. Midbrain

A. Anterior View.

Let's discover together what's special about this view??

If you noticed the optic chiasm and optic tract above, and the cerebral peduncles below, and then noticed the rhomboid مَعِين – like space between them, you'll be discovering a depression منخفض called **interpeduncular fossa** " fossa, a depression below the general surface level of a part; a recess".

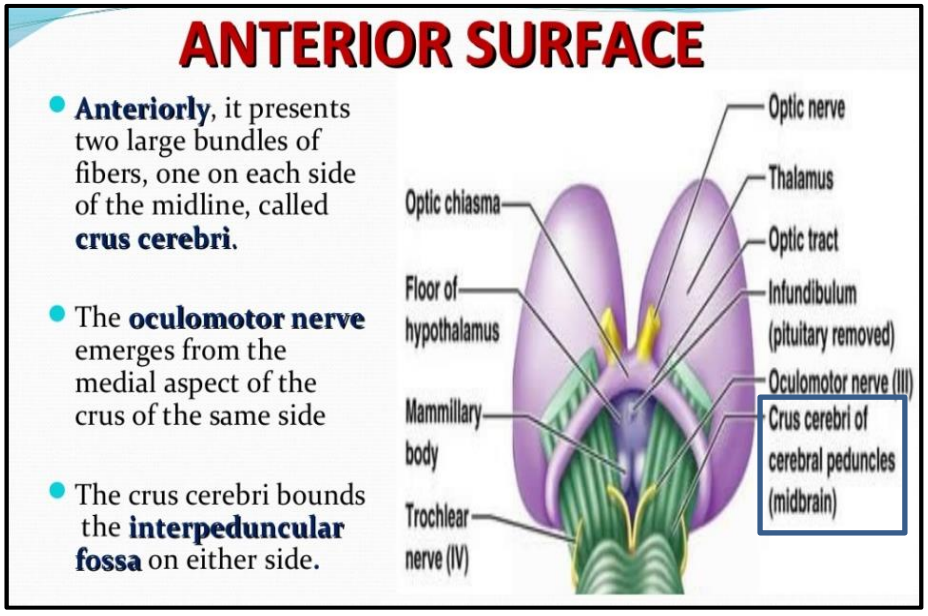


Figure 8: Anterior view of the Midbrain

Why is it named so?? Because this fossa is between the two CEREBRAL PEDUNCLES.

This fossa contains a lot of important structures plus important relations, let's find them out together!

a) If you came baaack to the first large figure, you'll notice on it an arterial supply in a shape of a circle. This circle is called "Circle of Willis", which we mentioned previously its role in greatly minimizing risk of brain ischemia. (Figure 9)

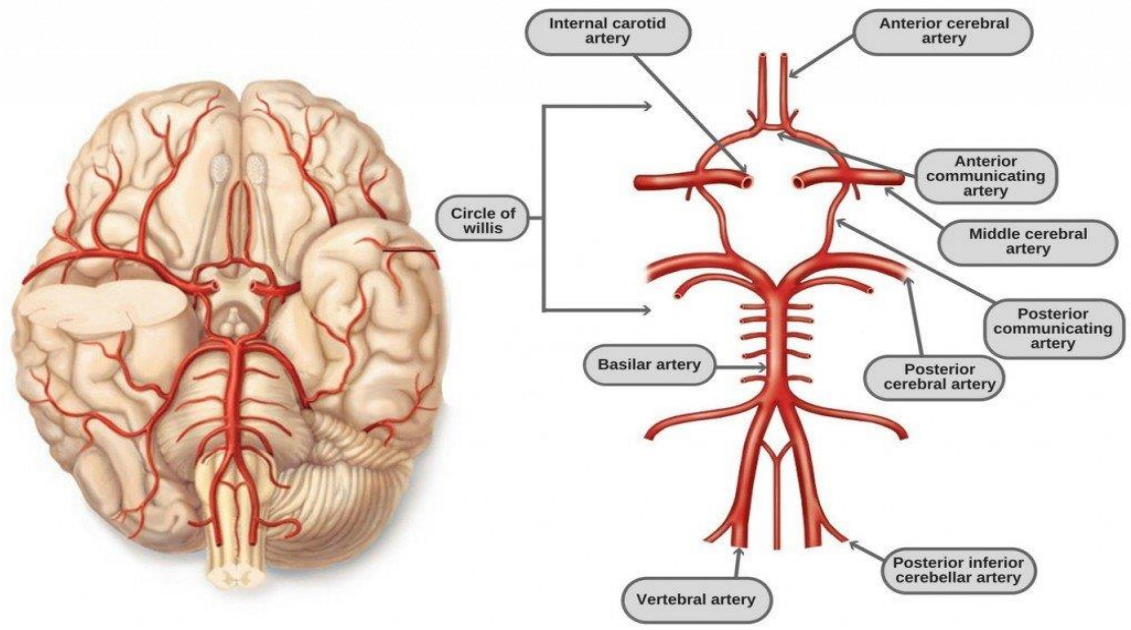


Figure 9: Arterial supply of the brain; Circle of Willis

b) Boundaries of the interpeduncular fossa (Figure 10):

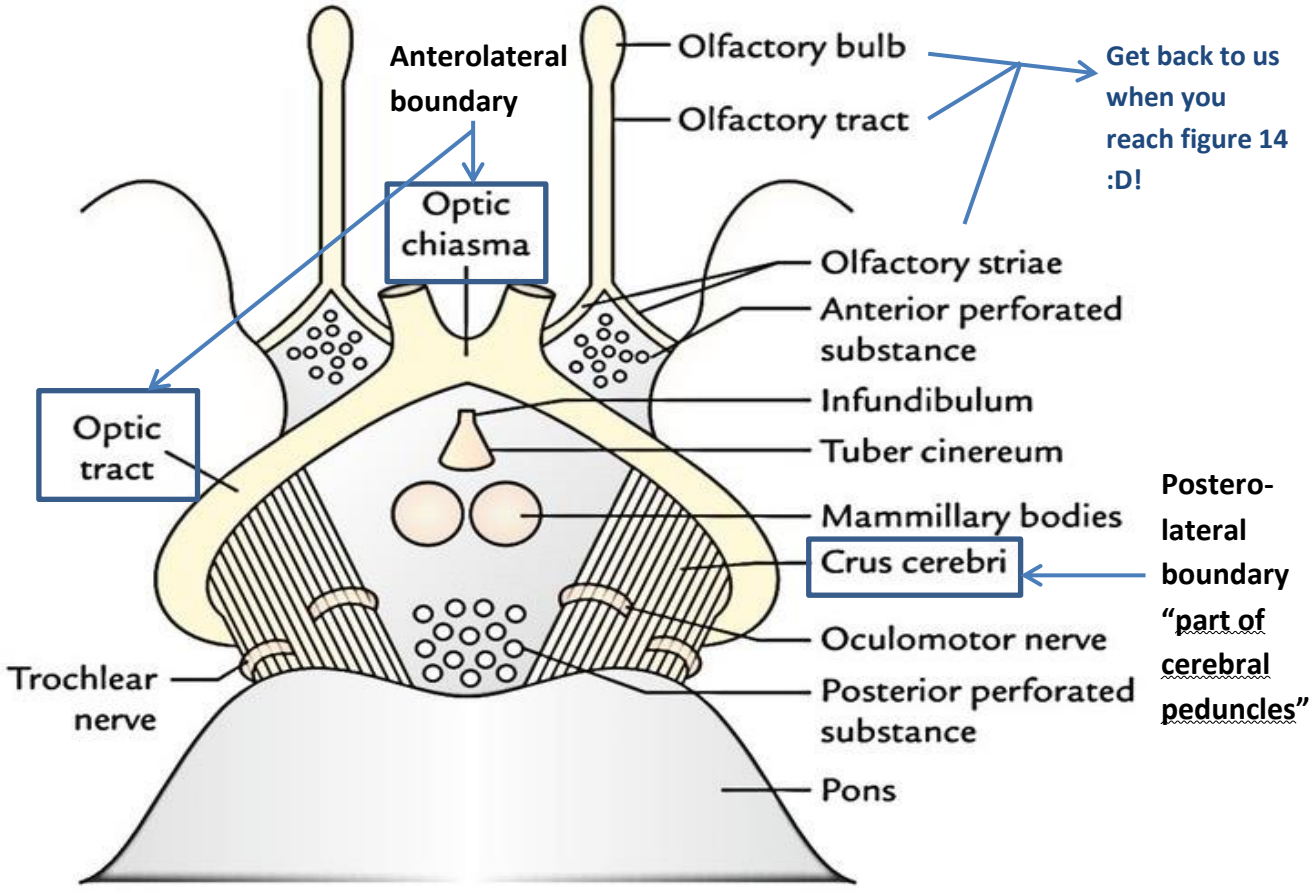


Figure 10: Anterior view of Midbrain; Interpeduncular fossa

Very Important note: Base of the brain = Ventral surface of the midbrain = Interpeduncular fossa

1. Antero-Lateral boundary:

Optic chiasma; dicussation تصالب of the Rt. And Lt. Optic nerves, then we'll detect two tracts called optic tracts which descend on Rt. And Lt.; these optic tracts curve around the cerebral peduncles to reach where??? The **THALAMUS**. (Figure 11; Optic nerve tracts)

2. Postero-Lateral boundary:

Cerebral Peduncles.

(It's the large name), from it comes the Crus cerebri. When taking a transverse section in the Midbrain like in figure 4, you'll see cerebral aqueduct "aqueduct of Sylvius" that splits the midbrain into tectum "Superior and inferior colliculi" posteriorly and tegmentum anteriorly. Also you can see Substantia nigra "Niger; black", which if damaged will cause Parkinson's disease.

Note "mentioned but not required for Mid Exam": The thalamus is located inside the brain; in front of it is the hypothalamus; underneath it between it and the midbrain is the sub thalamus; far behind them is the epi-thalamus" pineal gland الغدة الصنوبرية", and lastly is the meta-thalamus which is formed by 2 nuclei "medial geniculate body and lateral geniculate body", these 2 are in the posterior end of the thalamus. The one responsible for vision is the Lateral geniculate body "geniculate; angled like a bent منثني knee (Geniculum in Latin is little knee)", so these optic tracts MUST reach lateral geniculate body which is the "CENTRE OF VISION". Then from the thalamus, optic RADIATION will exit, which is actually optic fibers that connect between the thalamus and the occipital pat of the brain, reaching to cortical center of vision to process what's seen and do proper visual reflexes.

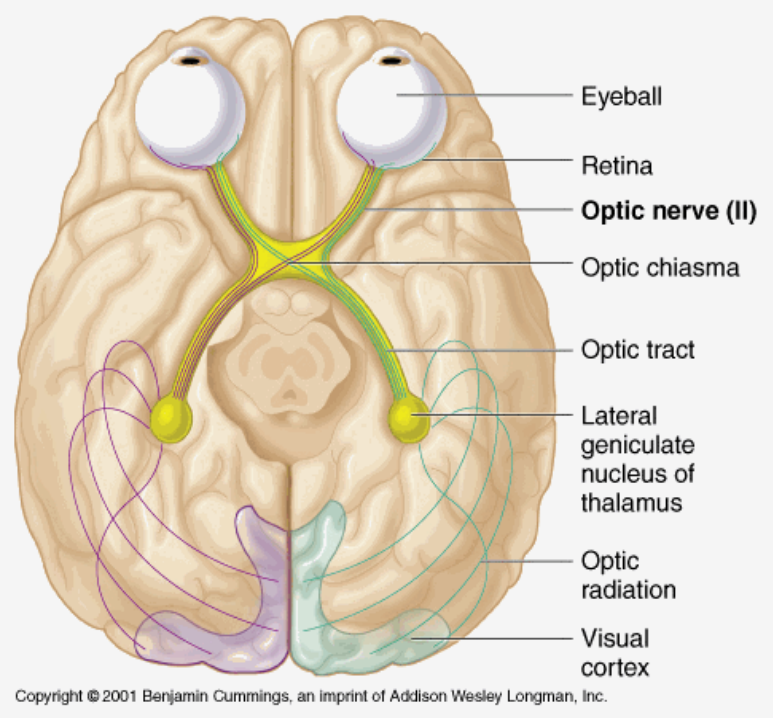


Figure 11: Optic nerve pathway

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c) **Contents** of the fossa (Figure 12):

1. 2 rounded structures called **Mamillary bodies**. They're nuclei of the hypothalamus that exist on the floor of the brain. When doing a sagittal section in the brain like in figure 13, you'll find the hypothalamus and you'll find the mammillary body as the lowest nucleus there.
2. You can notice an area which is perforated مُخَرمة in the floor of the fossa; this area is called **Posterior Perforated Substance**, why is it perforated??

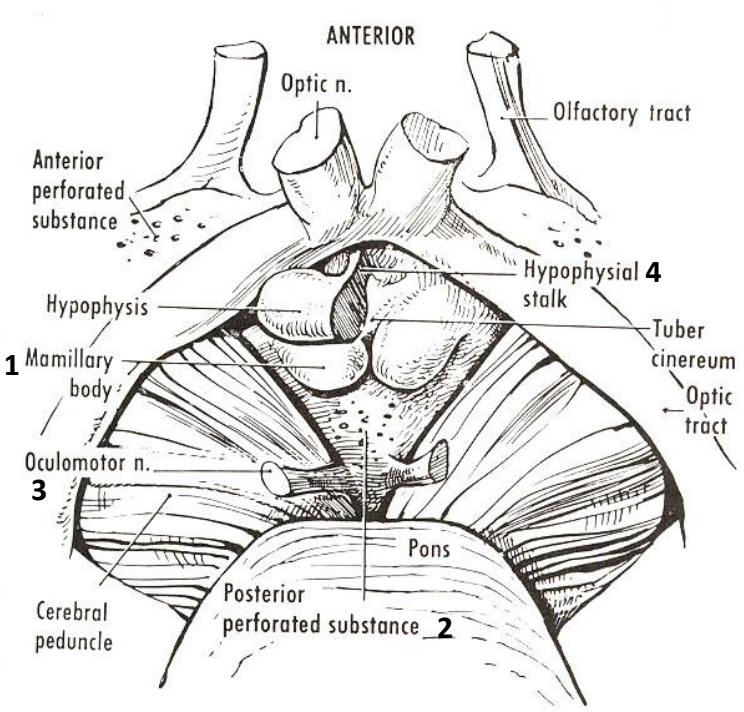


Figure 12: Contents of Interpeduncular fossa

Take a look at figure 14. Did you notice where some branches of the posterior cerebral artery (PCA) are entering??

Focus with me then get back to the first and largest figure. On the 2 sides of the medulla you'll see 2 arteries ascending, these arteries if you remember are branches from the 1st part of Subclavian artery, Remembered their name??? EXCELLENT, the vertebral arteries!

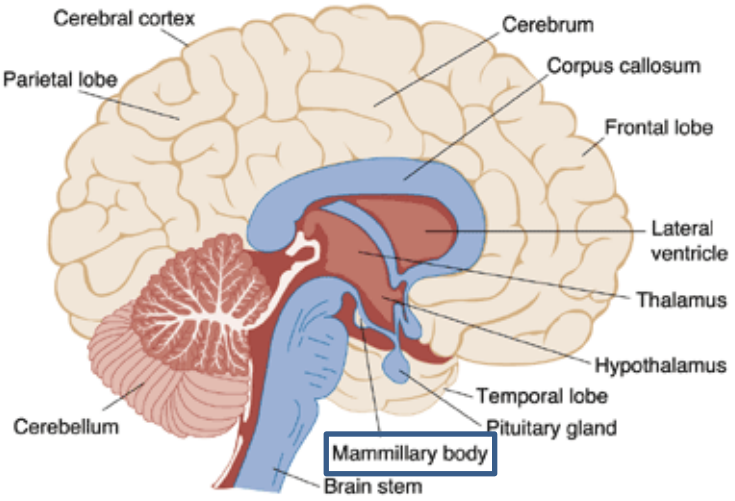


Figure 13: Sagittal section in the brain; mammillary body

After that if you remember they united to form a single artery that ran on a groove in the middle of Pons, the groove was named after this artery and since the groove is called basilar groove then the artery's name would be the BASILAR artery. At the superior surface of Pons, the basilar artery will split into 2 posterior cerebral arteries (PCAs), each on a side. These PCAs will give me central arteries that'll pass through the posterior perforated substance deep to supply brain's internal structures. NOW, you can get back to figure 1 and Enjoy!

Nice story right?! It's the magical masterpiece "your body" after all ♥

So since we have "POSTERIOR" perforated substance, WHERE IS THE "ANTERIOR"???

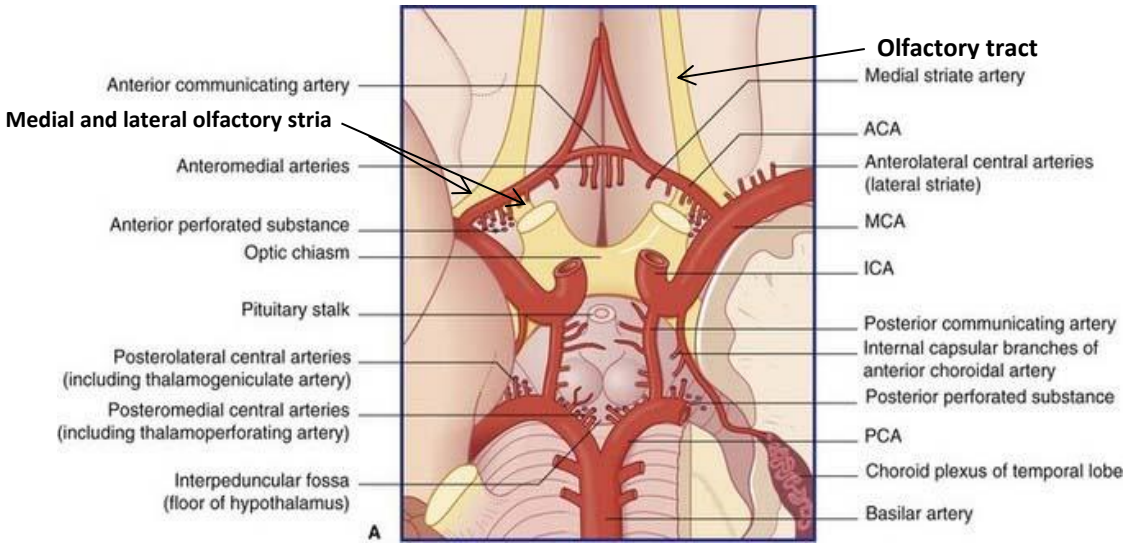


Figure 14: Base of the brain; arterial supply of the brain

As you can see in figure 14, we have 2 olfactory tracts on each side, each of these tracts end BELOW with medial and lateral Striae "Stria; a line, thin band شريط", between Lateral and medial striae lies the ANTERIOR perorated substance. We have 2 anterior perforated substances; each one is perforated by arterial branches from the Anterior cerebral artery (ACA) and Middle cerebral artery (MCA). "Remember that ACA and MCA are branches from the internal carotid Artery".

3. **Cranial nerves** attached to the midbrain.

We already knew that Olfactory nerve (1st C.N.) is way above the brain stem; its fibers pierce the cribriform plate of Ethmoid bone below it and reach the roof of nasal cavity to receive Odors. Also, the Optic Nerve (2nd C.N.) originates from back of the eye then its fibers undergo decussation then they go as tracts to lateral geniculate body in the thalamus until the whole long story ends. So if we ever tried to search, we won't find a nucleus in the brain stem for the 1st or 2nd C.N.

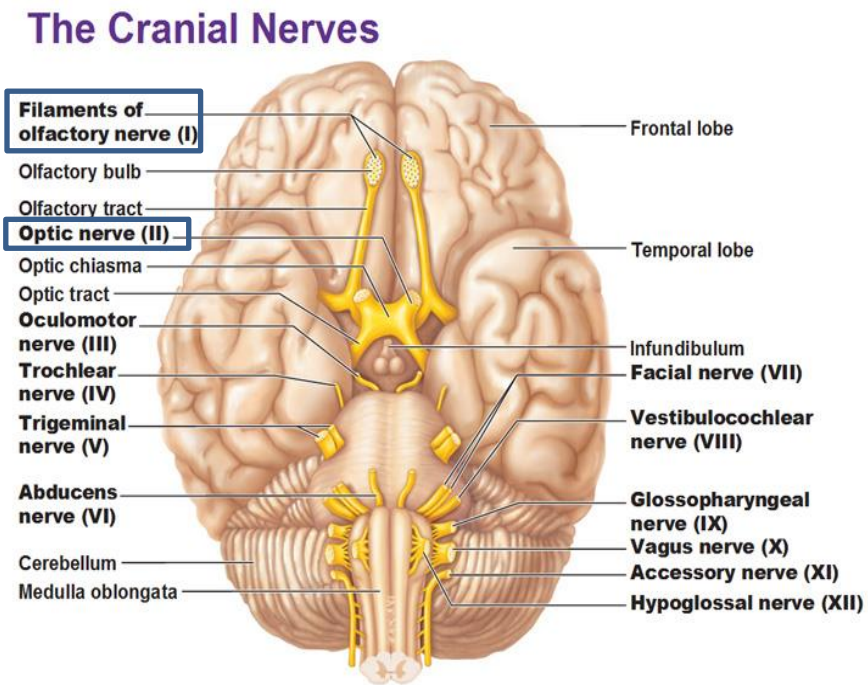


Figure 15: Cranial nerves

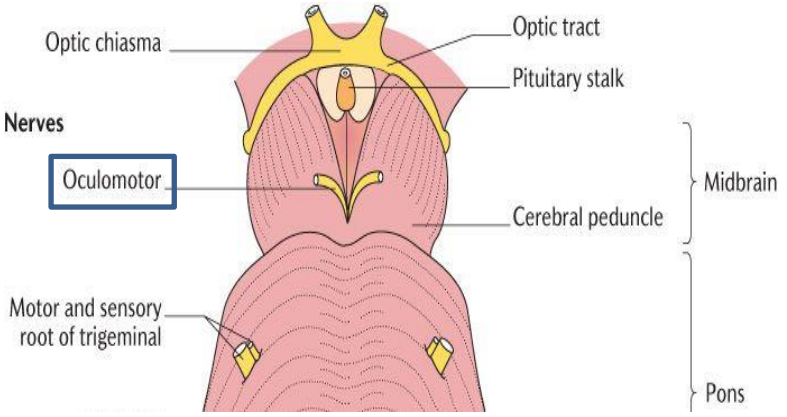
Which nerves are attached to the Midbrain??? The Oculomotor (3rd C.N.) and Trochlear (4th C.N.).

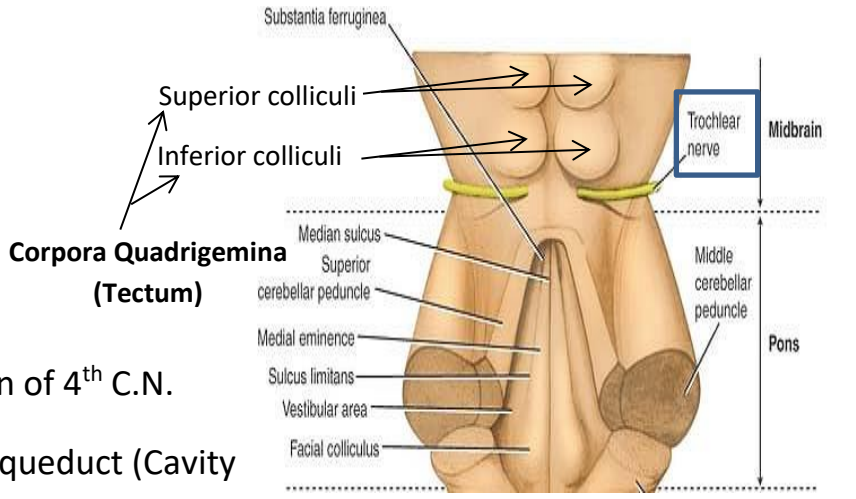
A. **Oculomotor Nerve** (3rd C.N.):

- Where is its superficial attachment?
Interpeduncular fossa, medial to Crus cerebri.

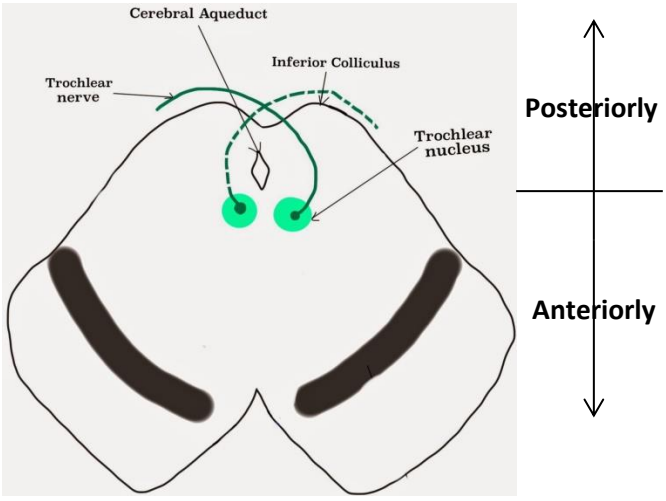
B. Trochlear Nerve (4th C.N.):

The only cranial nerve coming from **posterior.** When you take a look at the 3 views below, you'll notice that first, the trochlear nerve gets out **posteriorly** and **below the inferior colliculus**, then it walks along the cerebral peduncle laterally -just as if the 2 nerves are literally hugging the peduncles- then it finally reaches anterior surface of the midbrain.

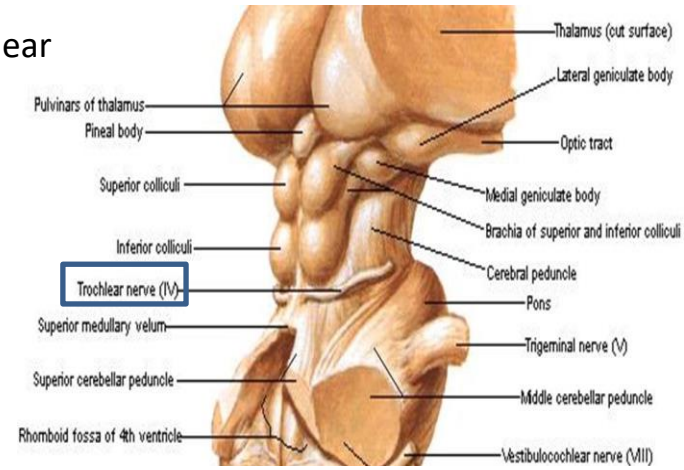


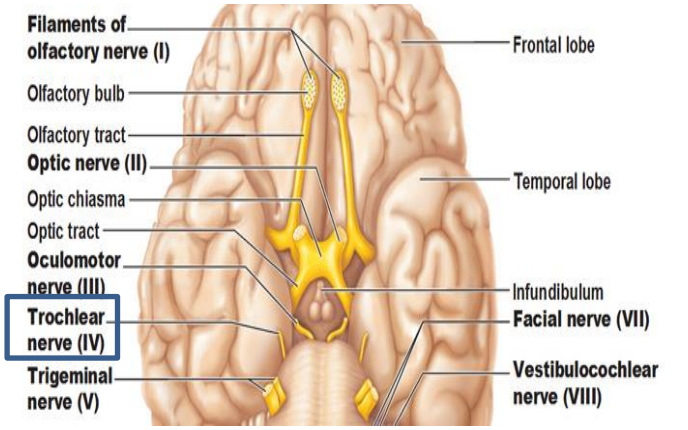


**Note: Figure 20 below shows the location of 4th C.N. nucleus which is Anterior to the Cerebral Aqueduct (Cavity of the midbrain). This picture illustrates how the trochlear nerves are actually getting from the opposite side of origin when they get out posteriorly underneath the inferior colliculi.



Figures 20: X-section in the Midbrain showing Trochlear nerve decussation before emerging posteriorly under the inferior colliculi.





Figures 16-19: Oculomotor Nerve; Trochlear Nerve in different views "Posterior, Postero-Lateral, and Anterior".

Ultimately, the trochlear nerves simply get out from the tectum of the Midbrain, below the level inferior colliculi.

4. Lastly, hanging from the inter-peduncular fossa is an important sweet little endocrine gland. It's for sure the pituitary – A.K.A. Hypophysis - gland. This gland is situated in the cranial cavity in the "Sella Turcica سرج الحصان ", and connected to above by its stalk which is called "**The infundibulum**". This infundibulum is seen starting inside the fossa from a thing called median eminence. (Please get back to figure 12, 3).

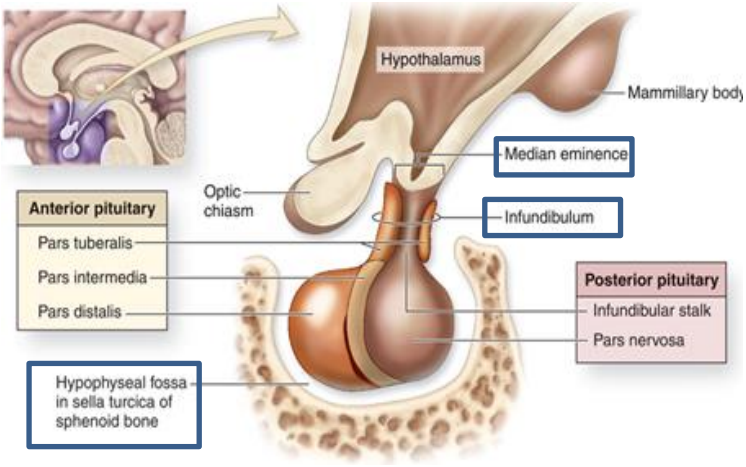


Figure 21: Pituitary gland; Sagittal section in the brain

B. Posterior view "Discussed earlier".

2. Pons

A. Anterior view.

- A Land mark for the Anterior view is a groove in the middle of Pons which we mentioned previously, the Basilar Groove, which Basilar A. passes on.

- We can also find fibers that originate from it; these Wavy fibers are called Transverse Pontine Fibers. These fibers are important because they're made by tracts!

Remember Cortico-Ponto-Cerebellar tract "Motor function regulation"??

These tracks pass from the cortex (Cortico-) down to the pons (Ponto-) to reach pontine nucleus, then the Rt. Fibers go to Lt. Side, and Lt. Fibers go to Rt. Side to reach the cerebellum (-Cerebellar) through middle cerebellar peduncles.

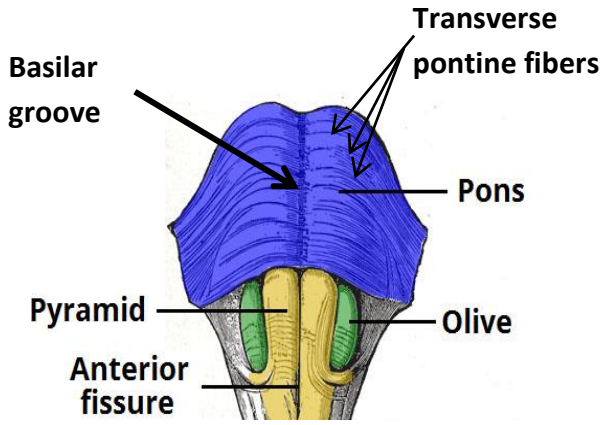


Figure 22: Anterior view of Pons

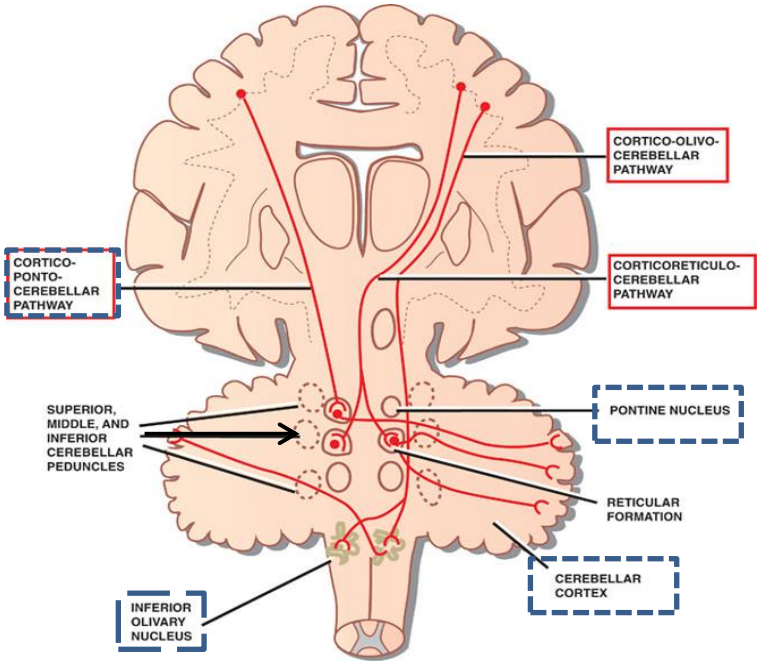


Figure 23: Consultation Tracts between cerebrum and cerebellum

This **decussation** of Rt and Lt fibers is what forms the pontine transverse fibers in that wavy shape.

- At the junction ملتقى of pons and middle cerebellar peduncle "which is the peduncle connecting between cerebellum and pons", we can see a big nerve showing up like a show star; it's the cranial nerve #5, the Trigeminal nerve (Please get back to figure 5). "Tri; three, Geminus; Twin"

You can clearly see in figure 24, that 5th C.N. has 2 roots; sensory and motor, and that the sensory root is bigger due to the fact that it contains 2 pure sensory branches (Ophthalmic and Maxillary). The motor root is exclusively for the 3rd branch which is the Mandibular.

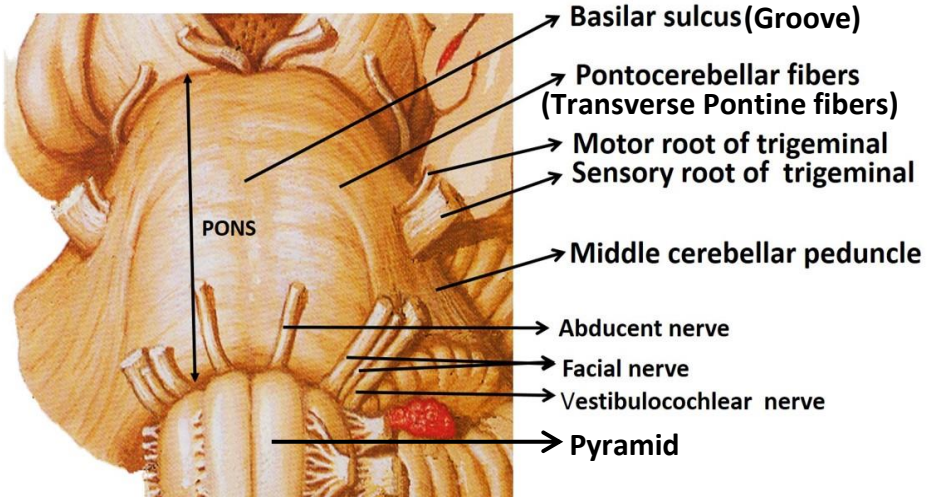


Figure 24: The 4 cranial Nerves originating from pons

- Cranial nerves that are also attached to pons are the 6th, 7th and 8th C.Ns:

A. Abducent nerve (6th C.N.) gets out vertically between the pyramid "mentioned later" and Pons.

B. Facial nerve (7th C.N.) and Vestibulo-cochlear nerve (8th C.N.) get out from an area called Ponto-medullary junction (Ponto-medullary-cerebellar angle زاوية).

B. Posterior View "Not that important right now, you can go back to figure 7 to see it".

3. Medulla oblongata

A. Anterior View

- Land mark for medulla oblongata is the Anterior Median fissure "or septum"

- Next to it on each side, the PYRAMIDS. In the pyramids ion a lower level, Major motor decussation happens to give me the In-direct Lateral corticospinal tract fibers "since some fibers directly descend epsi-laterally without decussation".

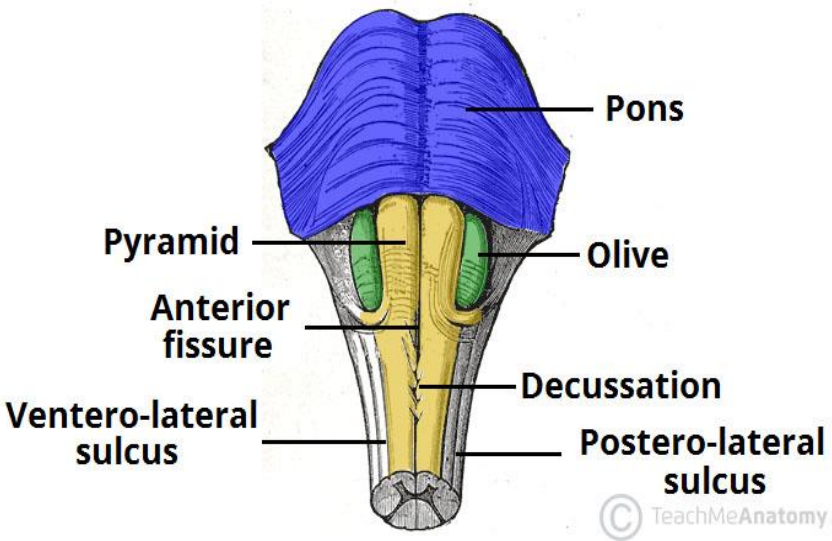


Figure 25: Anterior view of medulla oblongata

- After that, the olives on each side are seen; Inferior olivary nucleus is found in the olive(figure23).

- On each side you'll find a fissure in front of the olive and a fissure behind it; the one in front of it is called the antero- "or ventro" lateral fissure, while the one behind is sure called the postero-lateral fissure. These Fissures are sites of **Cranial nerves' emergence** ظهور.

A. Postero- Lateral fissure witnesses the emergence of 3 nerves from it; the Glossopharyngeal nerve (9th C.N.), the Amazing Vagus nerve (10th C.N.), and the CRANIAL root – remember it has a spinal root also - of the Accessory nerve (11th C.N.).

B. Antero- Lateral fissure will be preserved for the last cranial nerve to emerge from; the Hypoglossal nerve (12th C.N.)

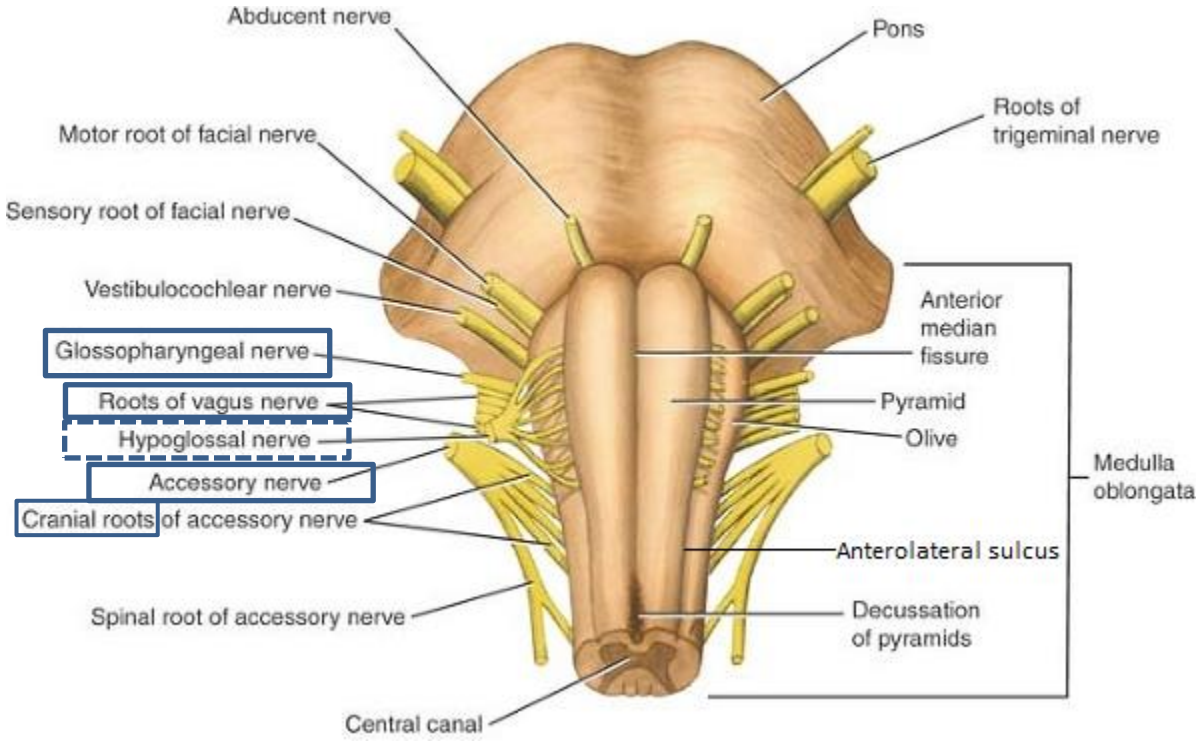


Figure 26: 4 Nerves emergence from medulla oblongata

B. Posterior View "Not that important right now, you can go back to figure 7 to see it".

Now we can SUM all this up :D!

1. Team "Cranial nerves" was distributed on the brain's play ground as following ----> 2:2:4:4

- First 2 cranial nerves emerged from the forebrain; they were for smell (olfactory; 1st) and vision (Optic 2nd).
- 2nd 2 cranial nerves emerged from the midbrain; they were mainly for eye movement. Oculo**motor** 3rd which emerged medial to the cerebral peduncles "medial to inter-peduncular fossa".

Troclear 4th that supplies only one muscle which is superior oblique muscle “SO4”; it emerged from posterior of Midbrain below the level of inferior colliculus.

- The 4 Cranial nerves after them were related to Pons; one of the biggest stars was Mister Trigeminal (5th C.N.) which gives sensation to the whole face except posterior angle of Mandible, it emerged from the junction between the pons and middle cerebellar peduncle.
  Abducent nerve (6th) that supplies one muscle which is Lateral rectus “LR6; it emerged vertically from the junction of pyramids with pons.
  Facial nerve (7th) and Vestibulocochlear nerve (8th) which emerged from the Ponto-medullary junction “ponto-medullary cerebellar angle”.

** Notes: Lateral Rectus and Superior Oblique are from the external eye muscles.

Abducens; drawing away سحب.

- The last 4 cranial nerves were emerging from medulla oblongata, specifically from fissures within it; 3 cranial nerves from the posterolateral fissure (Glossopharyngeal 9th, Vagus 10th, and CRANIAL root of Accessory 11th), and the last cranial nerve from the Antero-lateal fissure (Hypoglossal 12th).

2. Interpeduncular fossa “Ventral surface of Midbrain”:

A. Boundaries >>> Anterolateral: optic chiasm and tracts; Posterolateral: Cerebral peduncles

B. Contents >>> Mamillary bodies “Lowest nuclei of hypothalamus”; Posterior perforated substance “Central arteries of Posterior Cerebral Artery pass through it”; 3rd C.N. emerging medially, and 4th C.N. coming from posterior; the infundibulum of the pituitary gland.

NOW, get back if you wish to **Figure 10** and assign the contents :D !

Following is a large figure showing lateral and anterior views of the brain stem, and then 3 lab drawings which were drawn by the Amazing Dr.Maha ♥

Thank you very much, and may your moments be blessed with all good and happiness ♥

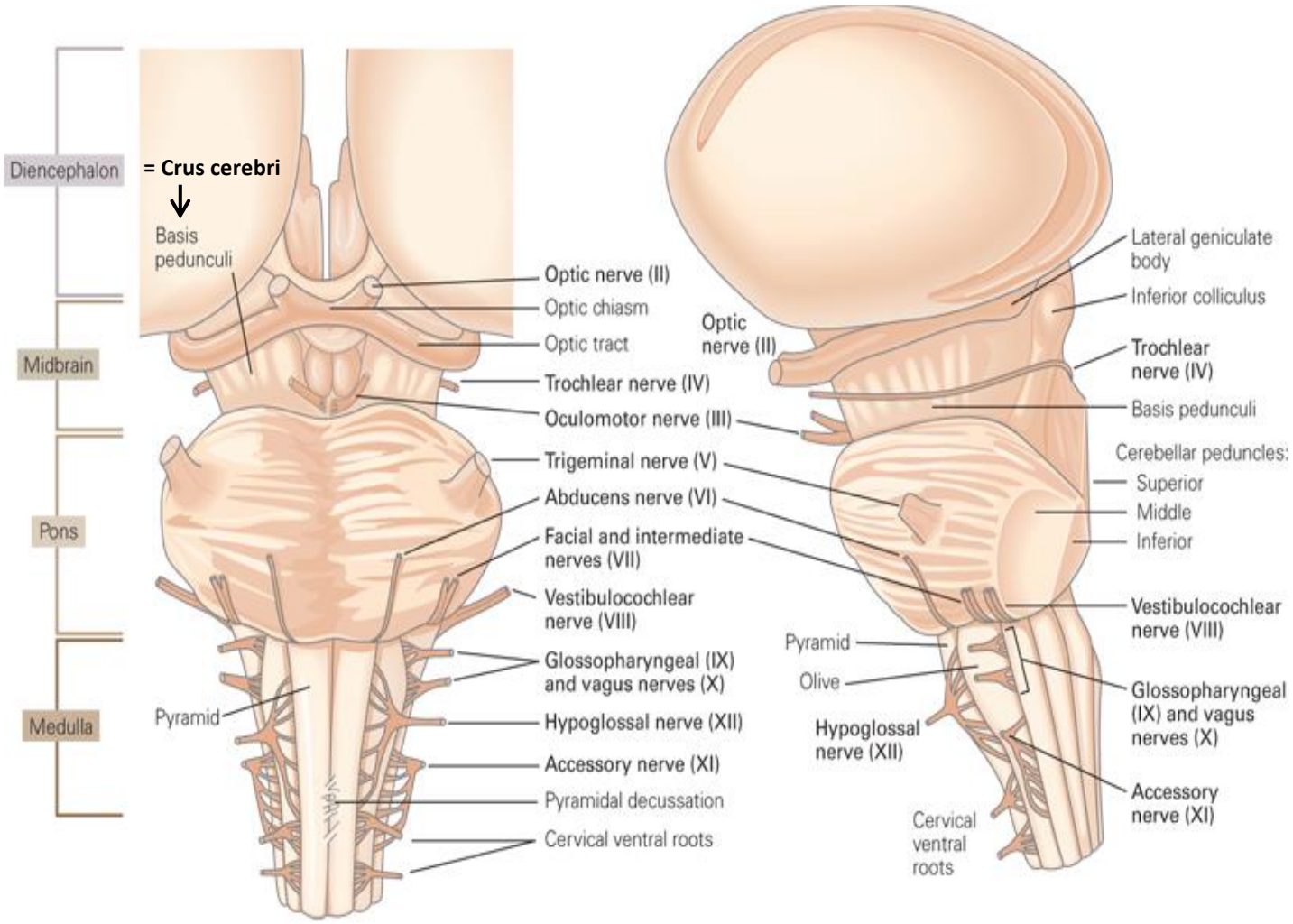
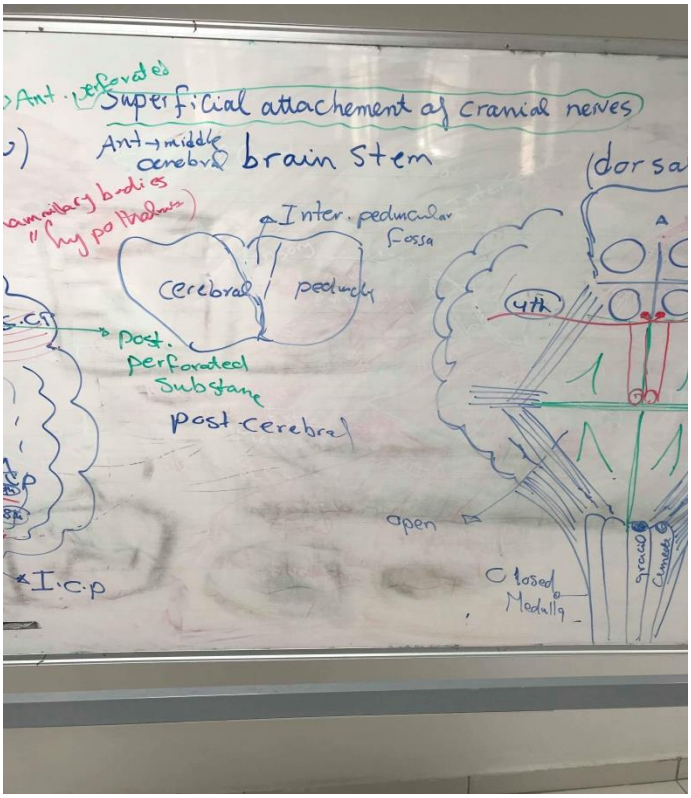
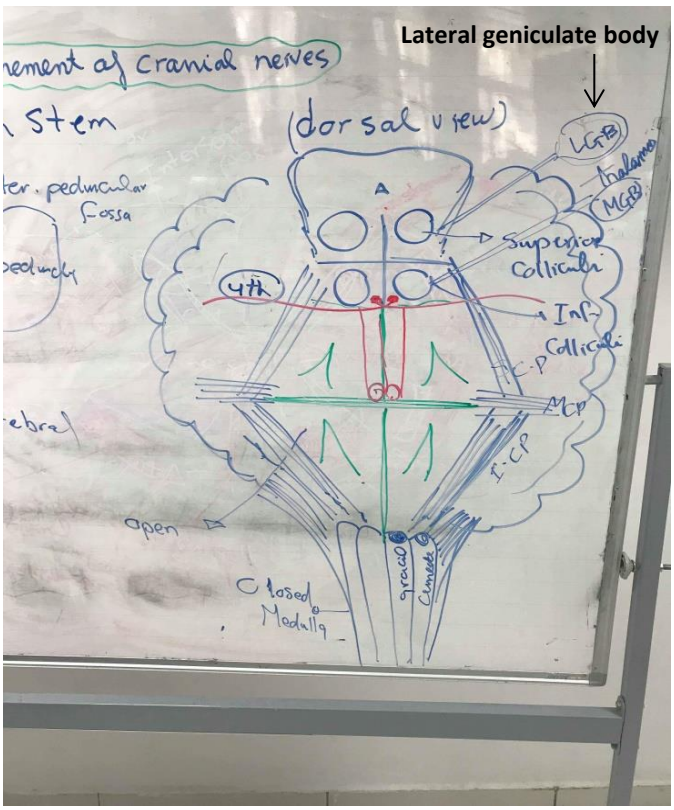
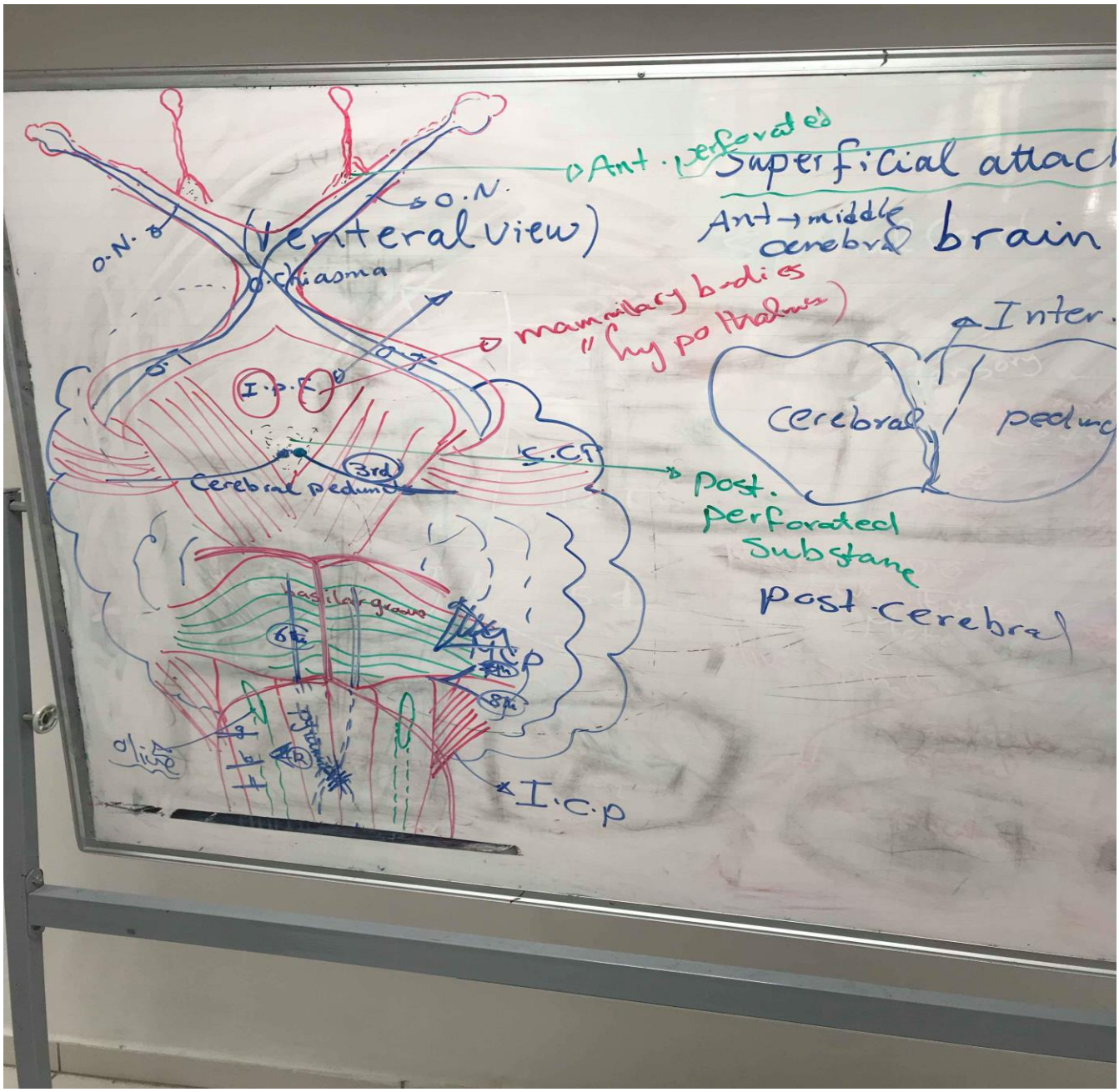


Figure 27: Anterior and Lateral view of the brain stem






Ant. perforated
Superficial attach
O.N.
(Ventral view)
O.N.
Ant → middle
cerebral
brain
Optic chiasma
mamillary bodies
(hypothalamus)
Inter.
Cerebral
pedun
I.P.F.
3rd
S.C.P
Cerebral peduncle
Post.
perforated
Substance
Post. Cerebral
Basilar groove
I.C.P
I.C.P