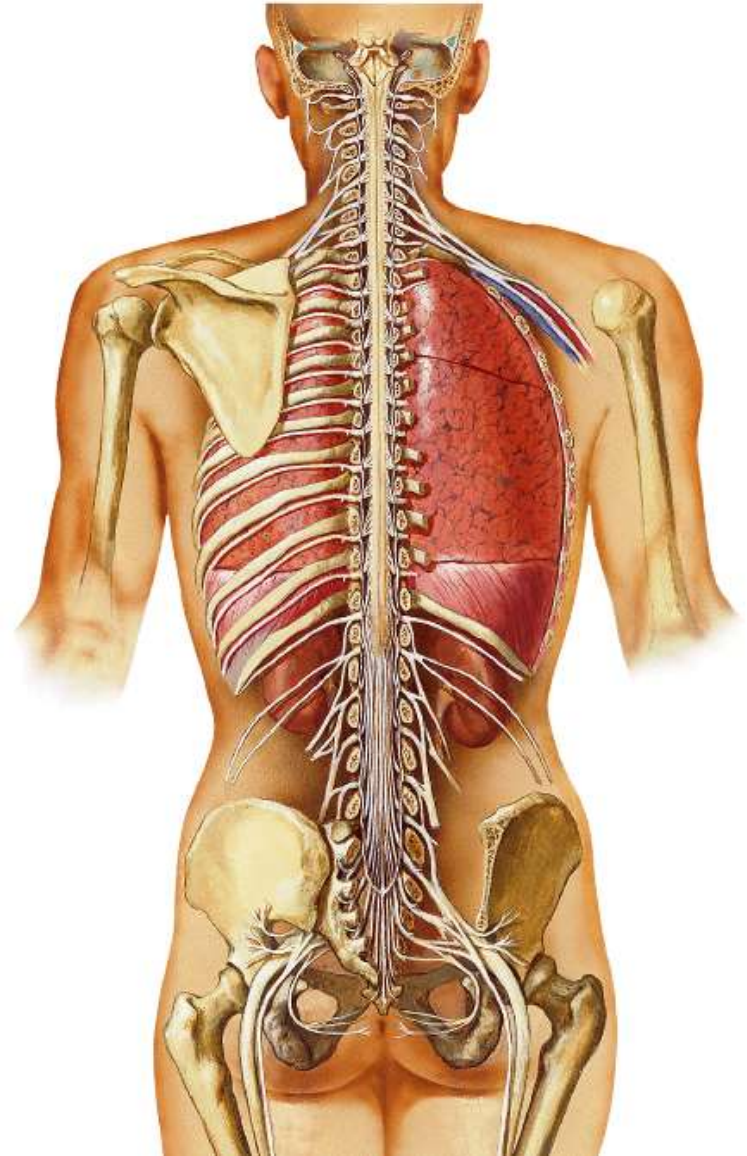


ANATOMY OF SPINAL CORD

BY
RAJEEV KUMAR MUKHIA

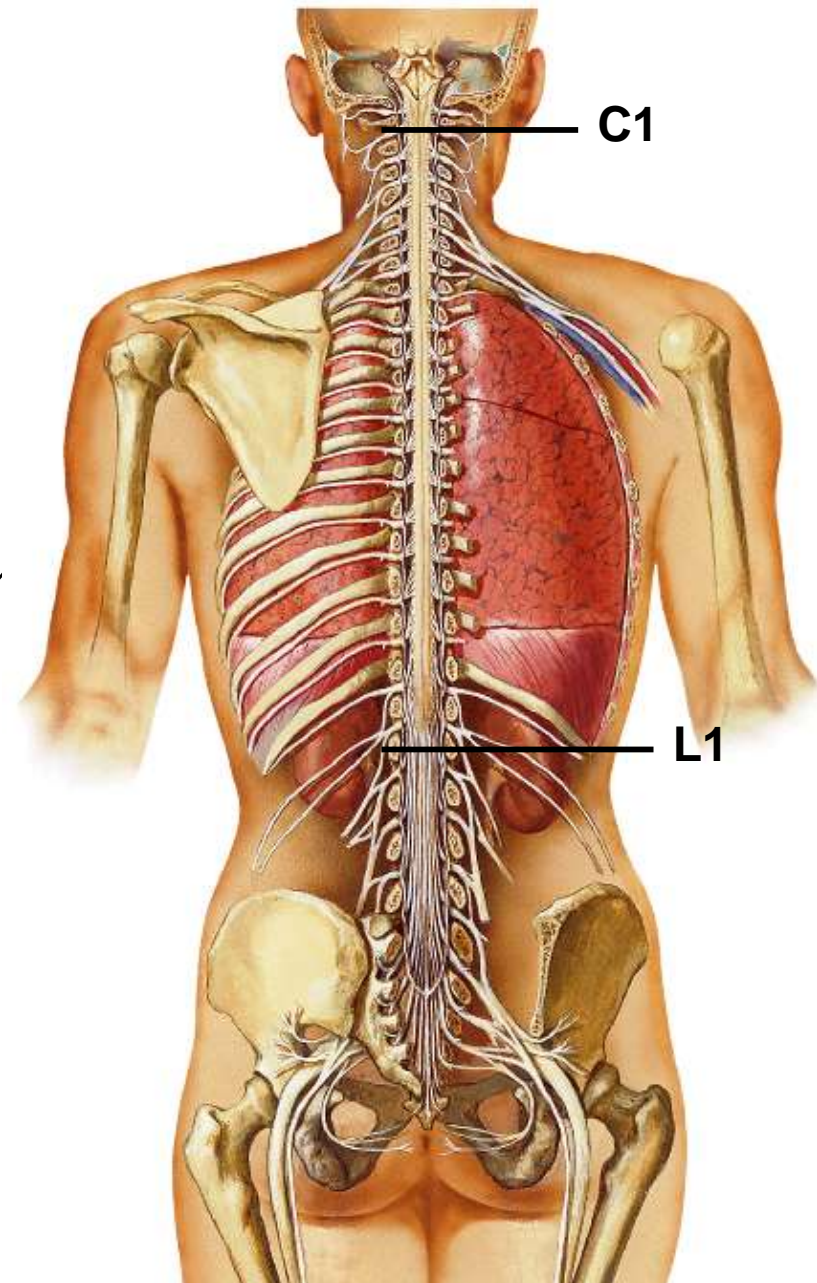
INTRODUCTION

- ❖ The spinal cord is the lower elongated part of the central nervous system (CNS).
- ❖ Cylindrical in shape
- ❖ Slightly flattened anteroposteriorly
- ❖ Measures about 45cm in adult male & 42 cm in female
- ❖ 30gm in weight

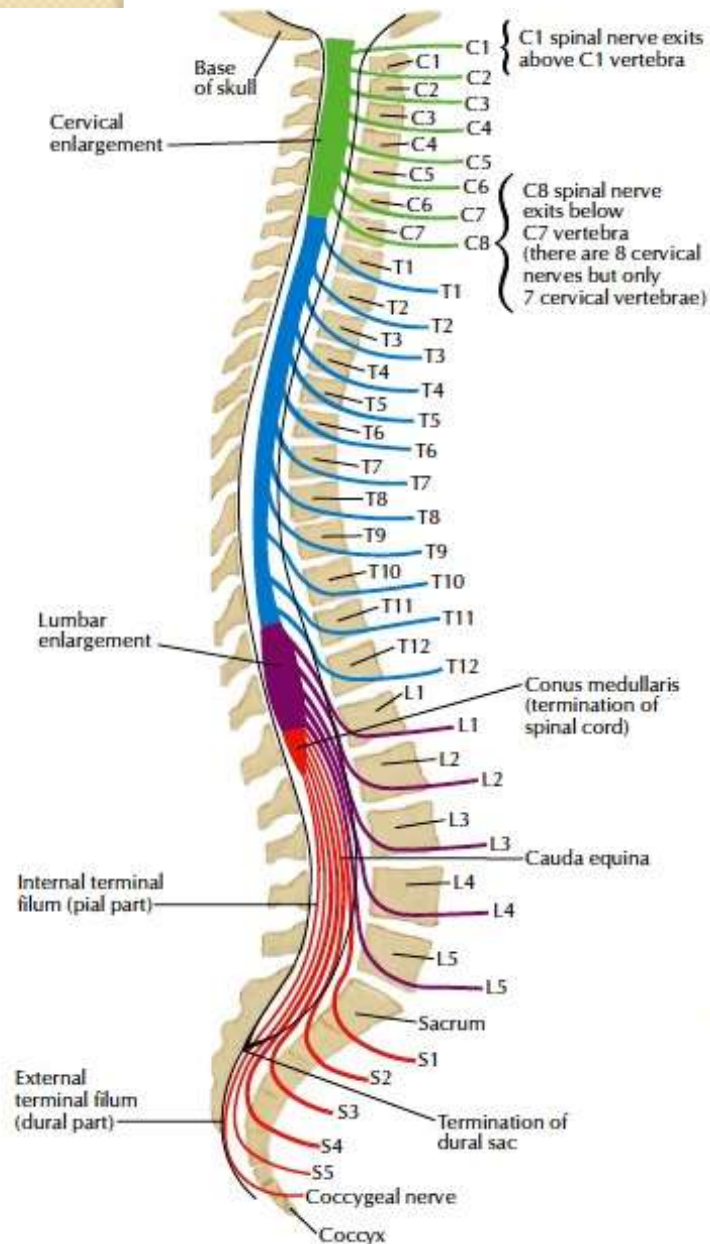


EXTENSION

- It extends as downward continuation of medulla oblongata from upper border of **first cervical vertebra** (C1) to the lower border of **first lumbar vertebra** (L1)
- Its lower tapering end is called as **conus medullaris**.
- Apex of the conus medullaris continues as a thin filament called **filum terminale**.



POSITIONAL CHANGES OF THE CORD

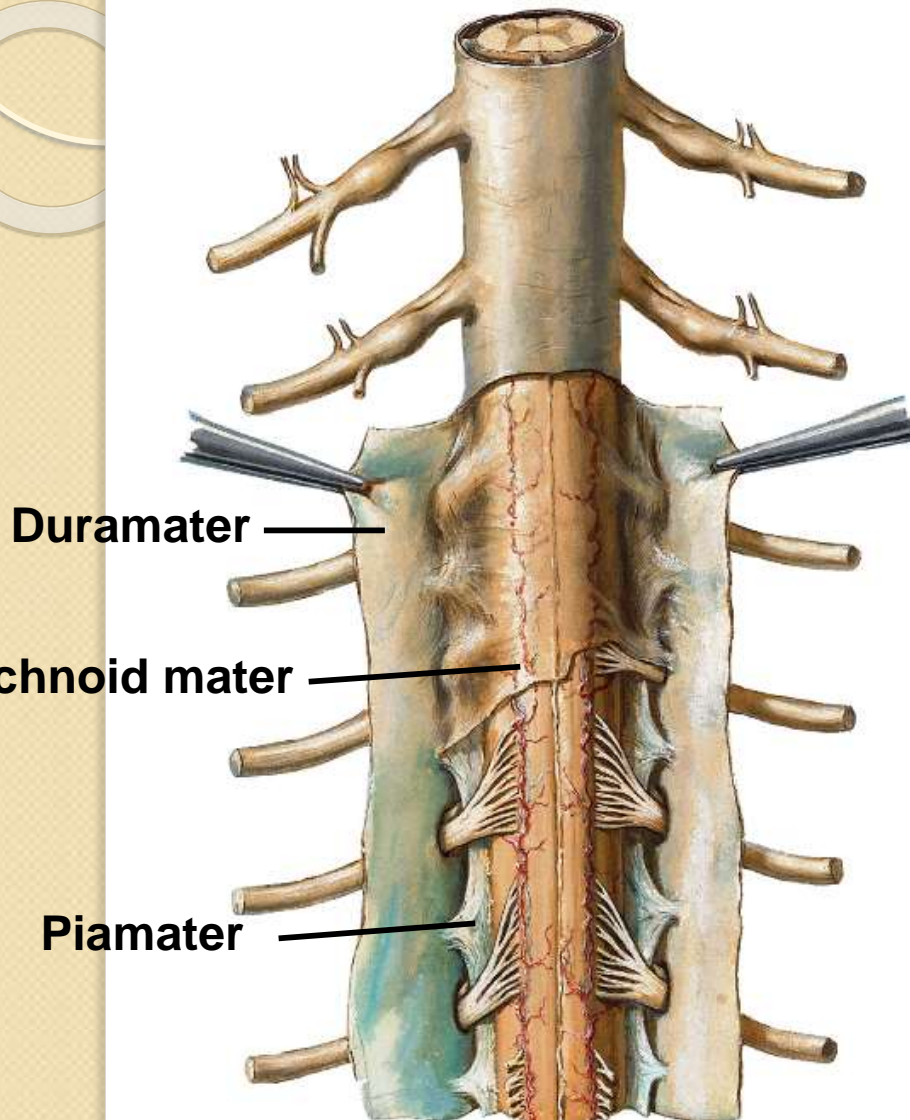


- 3rd month (IU Life) – Spinal cord is as long as vertebral canal.
- At birth – Spinal cord lies at L3.
- In adults – Spinal cord lies at lower border of L1.
- The knowledge of these variation in the vertebral level of the lower end of cord is imp. to avoid injury to the cord while performing lumbar puncture, specially in children.

SPINAL MENINGES

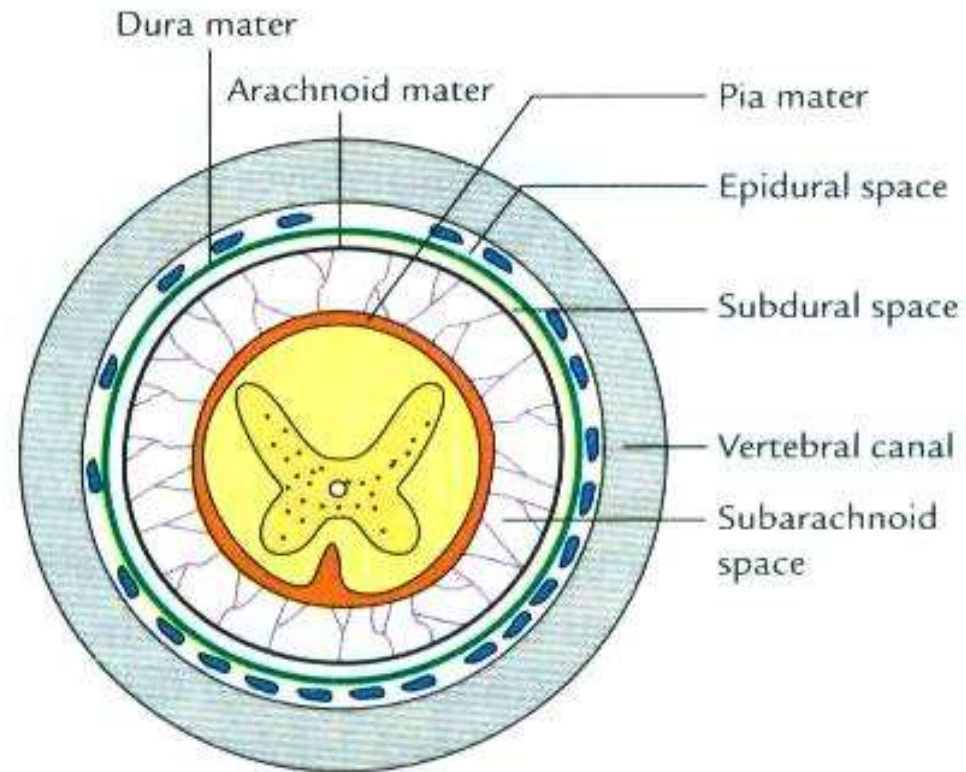
From outside inwards

- Dura mater
- Arachnoid mater
- Pia mater



SPINAL DURAMATER

- Extends from **foramen magnum** to lower border of **second sacral vertebra (S2)**
- The space between spinal dura and vertebral canal is called as **epidural space**
- The space between duramater and arachnoid mater is called **subdural space**

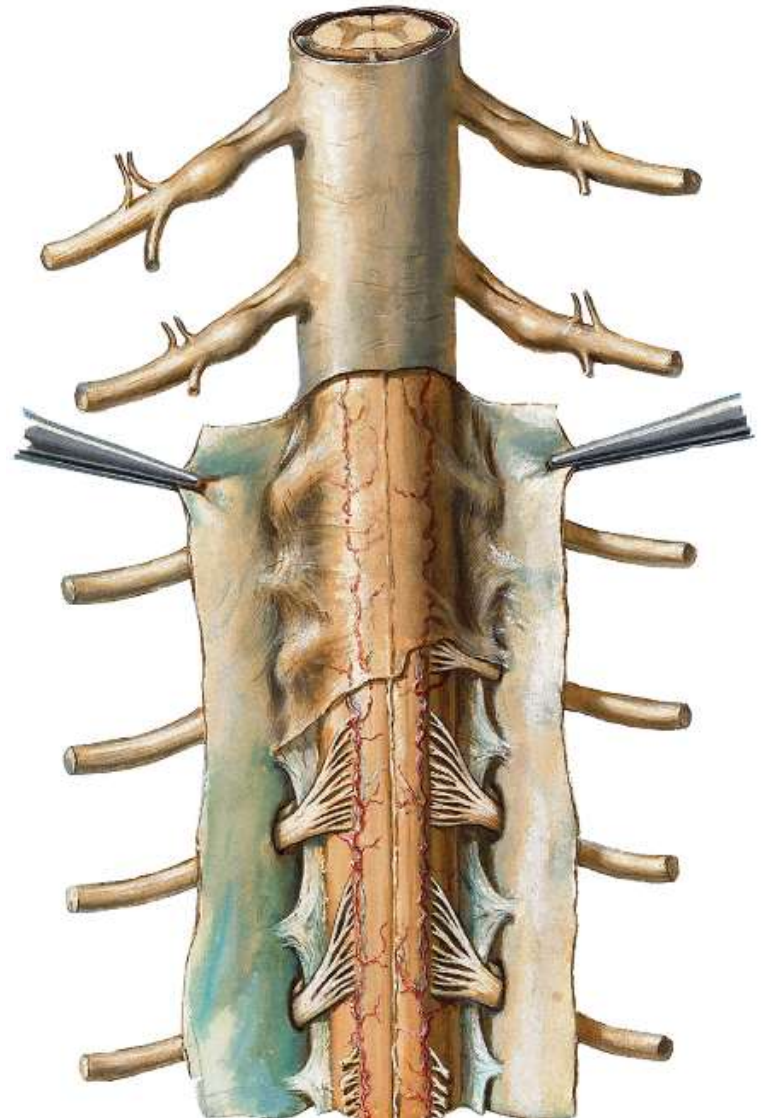


Differences between spinal & cranial dura

SPINAL DURA	CRANIAL DURA
<p>Single layered & consists of meningeal layer only</p> <p>Does not form folds</p>	<p>Double layered. Consists of inner meningeal layer and outer endosteal layer</p> <p>Forms dural folds viz. Falx cerebri, falx cerebelli, tentorium cerebelli, diaphragma sella</p>
<p>Epidural space present</p>	<p>Epidural space absent</p>

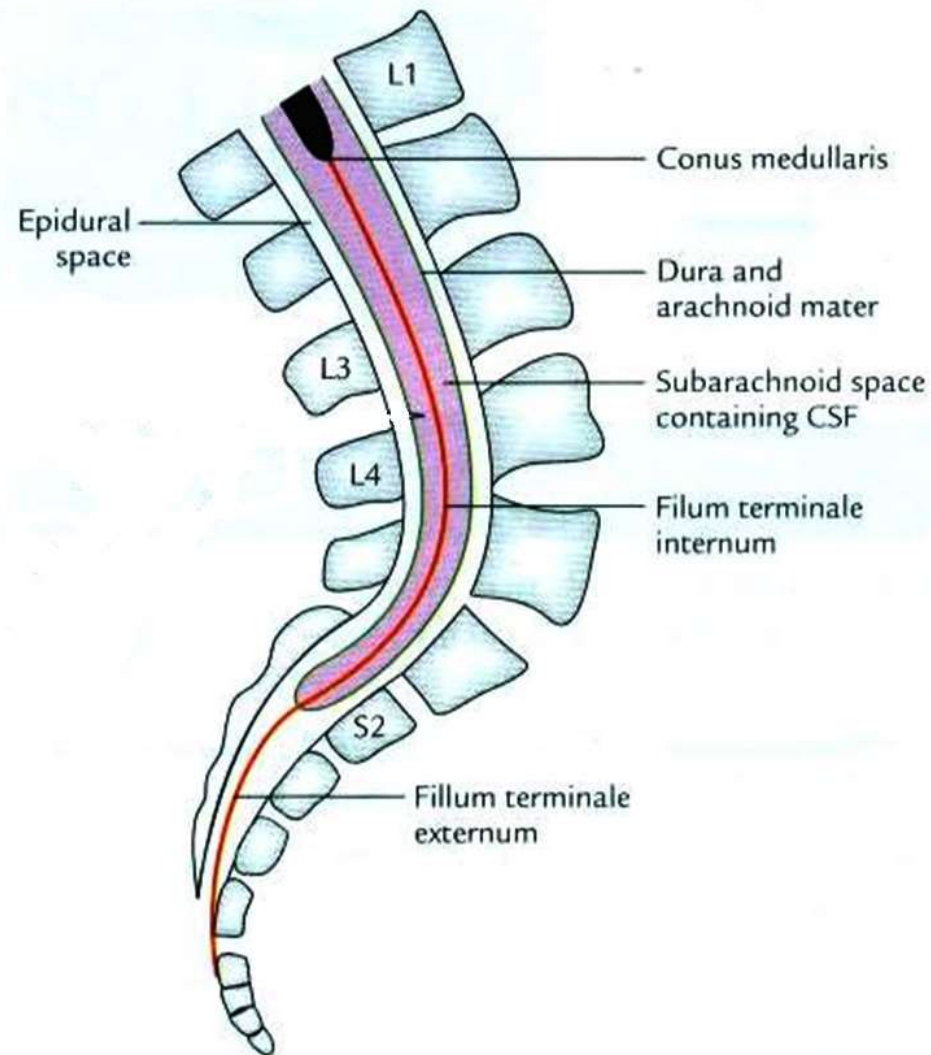
ARACHNOID MATER

- Thin transparent, avascular membrane which invests the spinal cord loosely.
- Above it is continuous with the arachnoid mater of the brain
- Below it extends upto the level of lower border of S2.



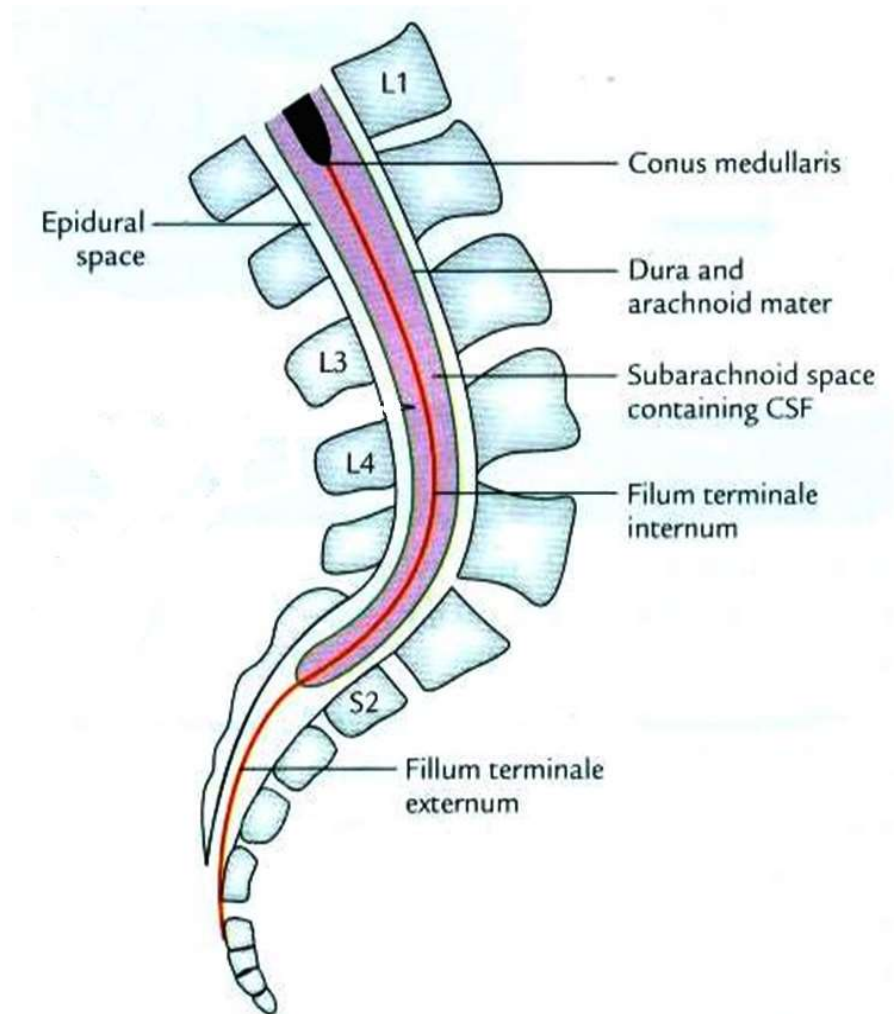
PIAMATER

- Thin highly vascular membrane that closely invests the spinal cord.
- Continues below the spinal cord as **filum terminale**.
- The space between the pia mater and arachnoid mater is called as **subarachnoid space** and is filled with **CSF**



LUMBAR CISTERN

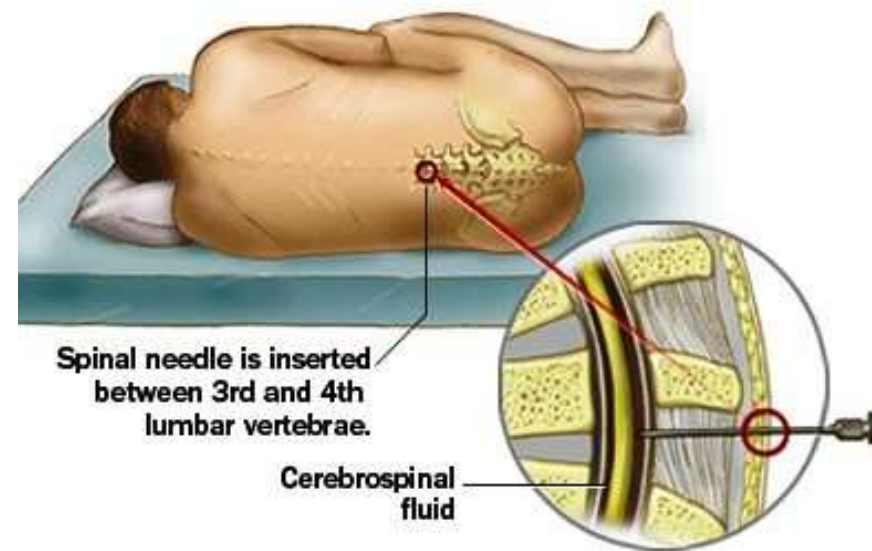
- The subarachnoid space around the filum terminale becomes roomy forming a pool of CSF called **lumbar cistern**.
- The lumbar puncture is done at this site to take out the CSF.



LUMBAR PUNCTURE

- It is done to withdraw CSF for various diagnostic and therapeutic procedures.
- Most preferred site: Interspinous space between L3 and L4.
- **LANDMARK:**

An imaginary line joining highest point on the iliac crest passes through the spine of L4.

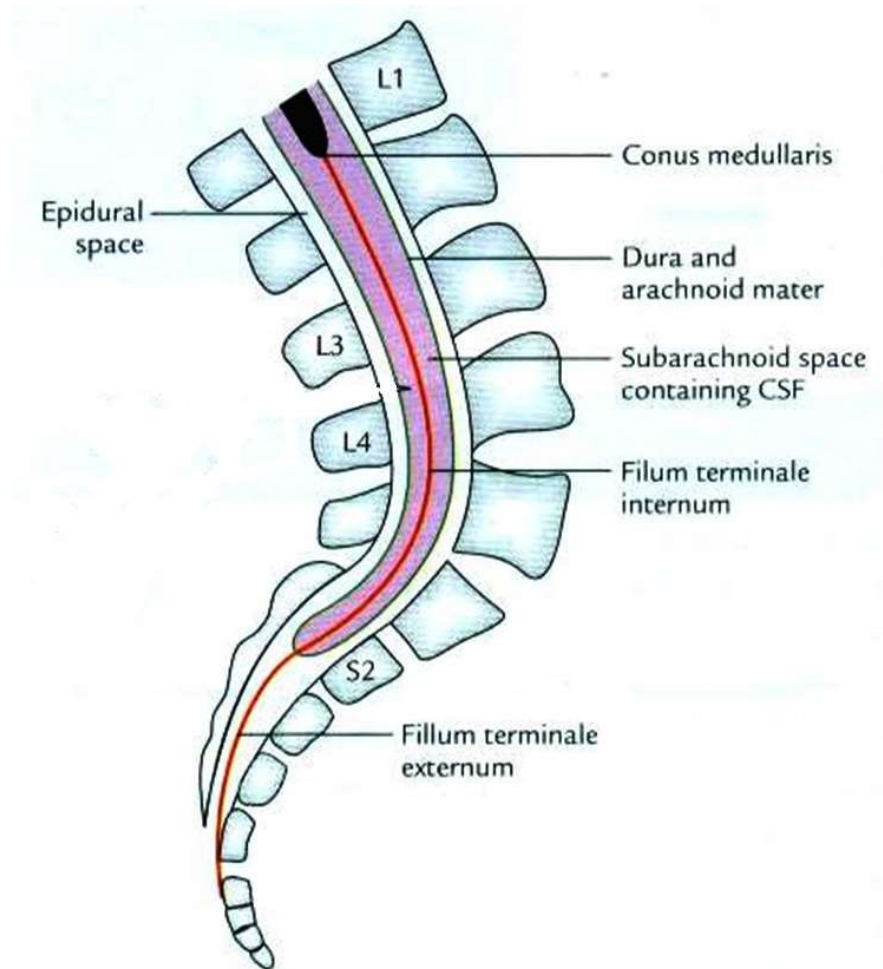


MODIFICATIONS OF PIAMATER

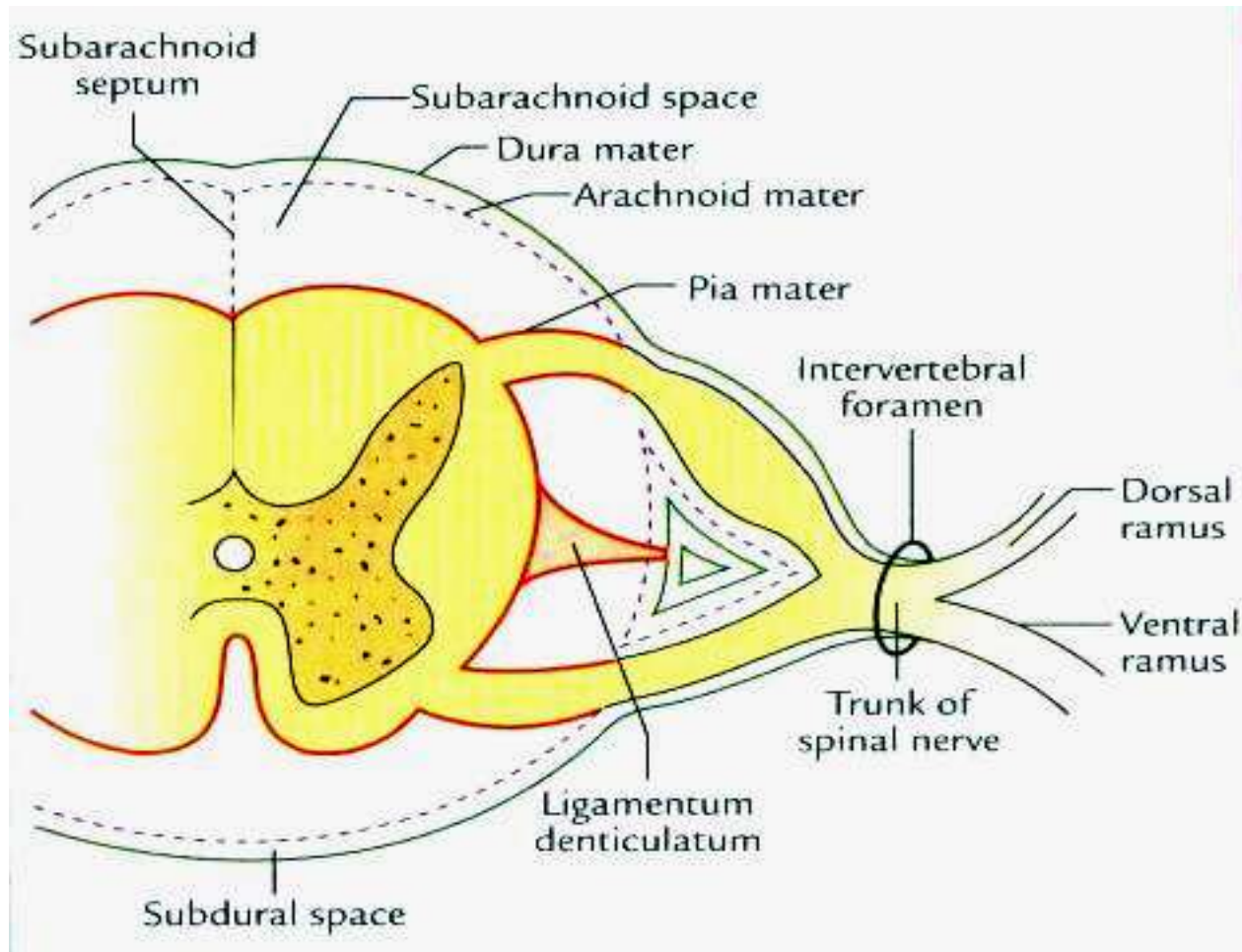
- Filum terminale
- Subarachnoid septum
- Ligamenta
denticulata

FILUM TERMINALE

- Delicate, white thread like structure
- Extends from tip of the conus medullaris to the first coccygeal vertebra.
- About 20cm long
- It has 2 parts
- **Filum terminale Internum – 15cm long & lies within the dural sac.**
- **Filum terminale Externum – 5cm long & lies outside the dural sac.**



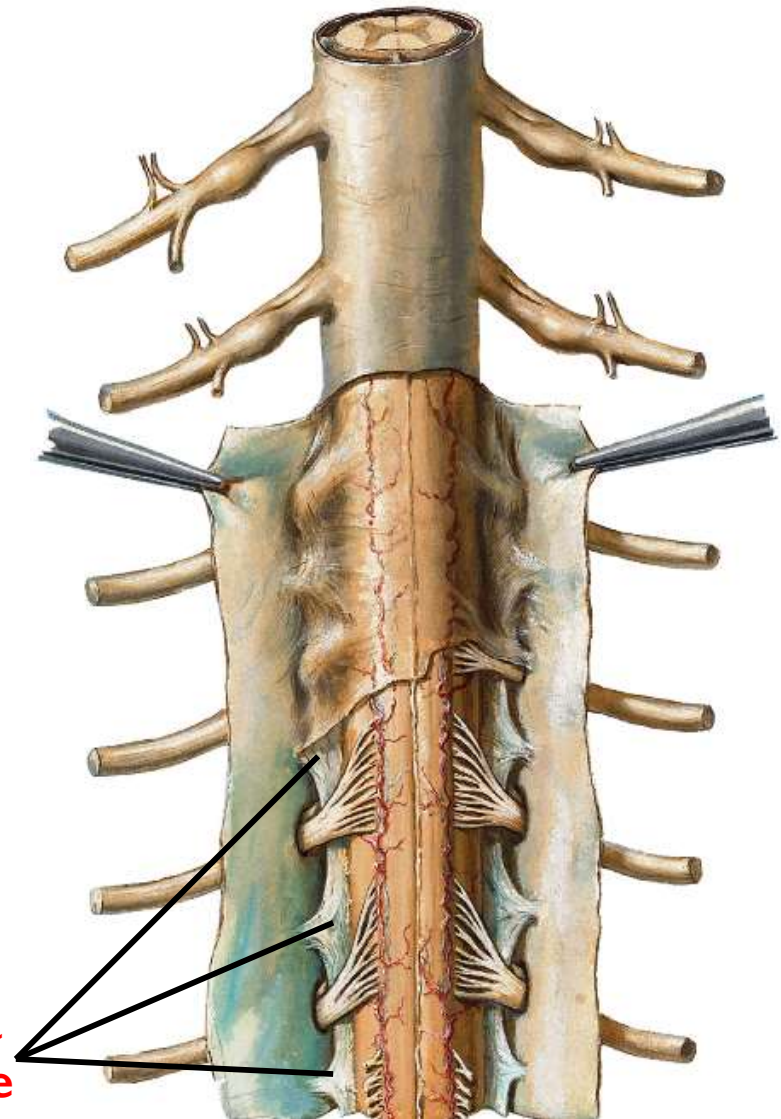
SUBARACHNOID SEPTUM



It is a mid-sagittal fenestrated pial septum which connects the dorsal surface of the spinal cord with the arachnoid mater.

LIGAMENTA DENTICULATA

- Two transparent ribbon like thickened bands of pia mater
- Extending laterally between anterior and posterior nerve roots
- The lateral margin of each band presents 21 tooth like processes which pierce the arachnoid.



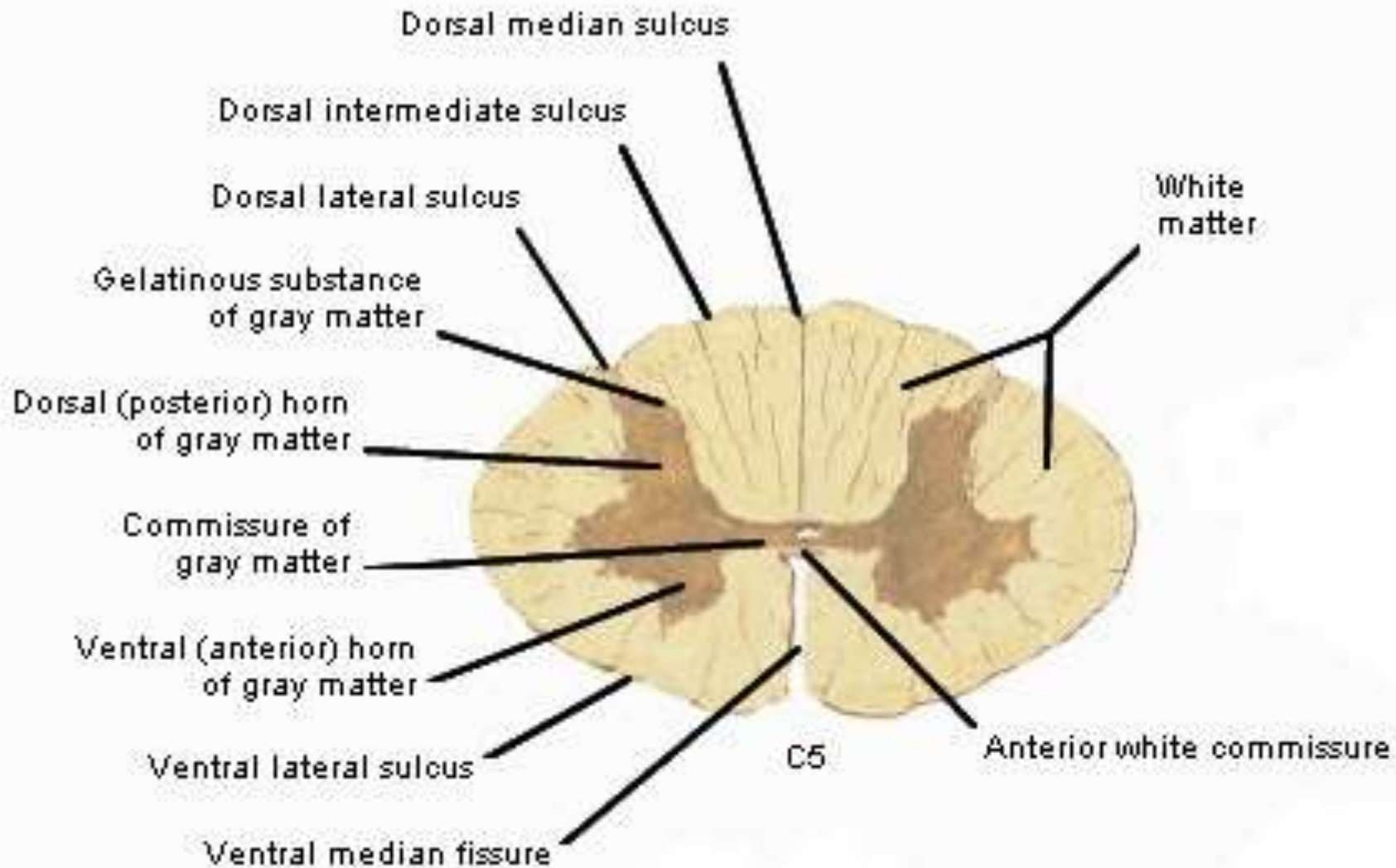
**Ligamenta
denticulate**

EXTERNAL FEATURES OF THE SPINAL CORD

- Fissure and sulci
- Attachment of spinal nerves
- Enlargements

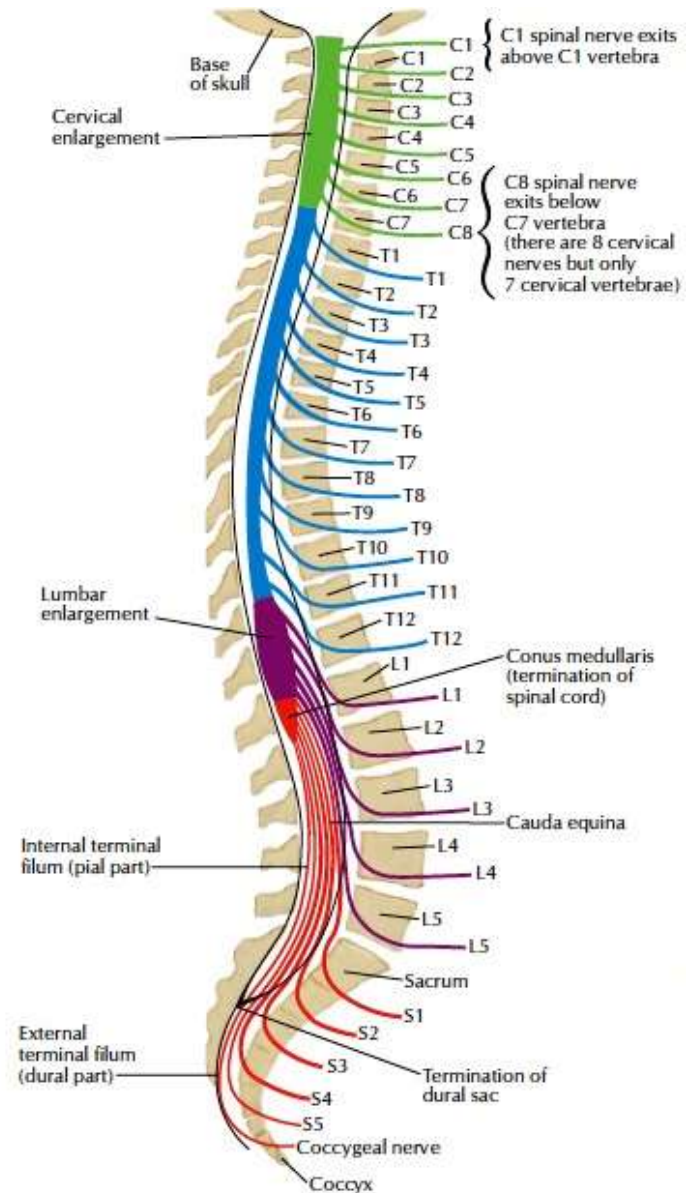


FISSURES AND SULCI

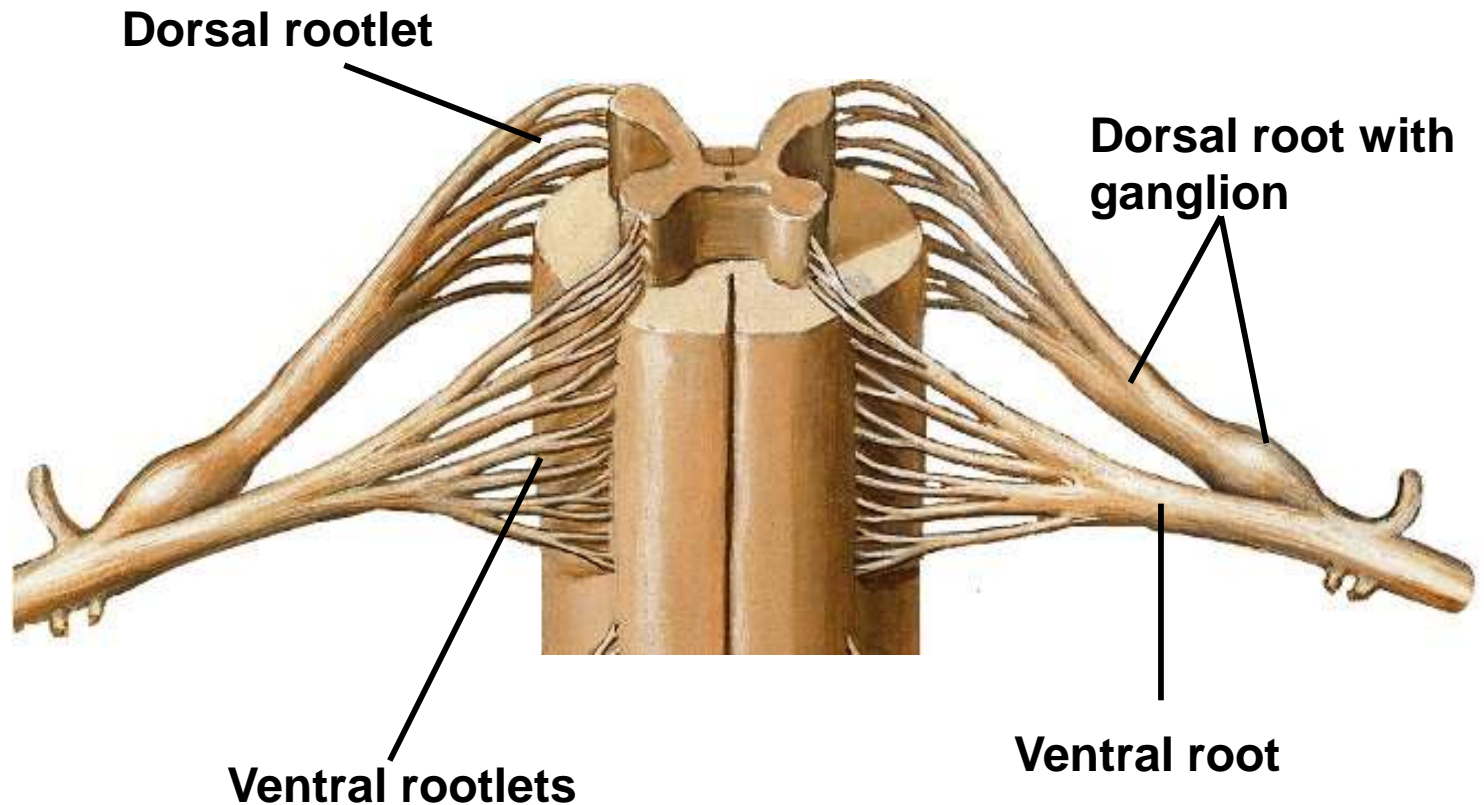


Attachment of spinal nerves

- Thirty-one pairs of spinal nerves emerge from the sides of the cord.
- Cervical-8
- Thoracic-12
- Lumbar-5
- Sacral-5
- Coccygeal-1

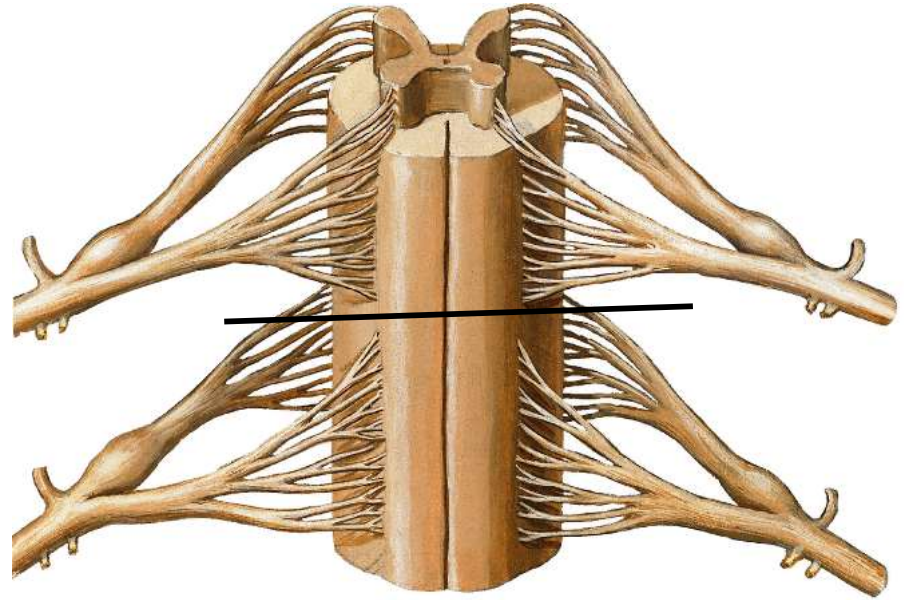


- Each spinal nerve is attached to the cord by the two roots, anterior motor root & posterior sensory root.
- The posterior root has a ganglion.



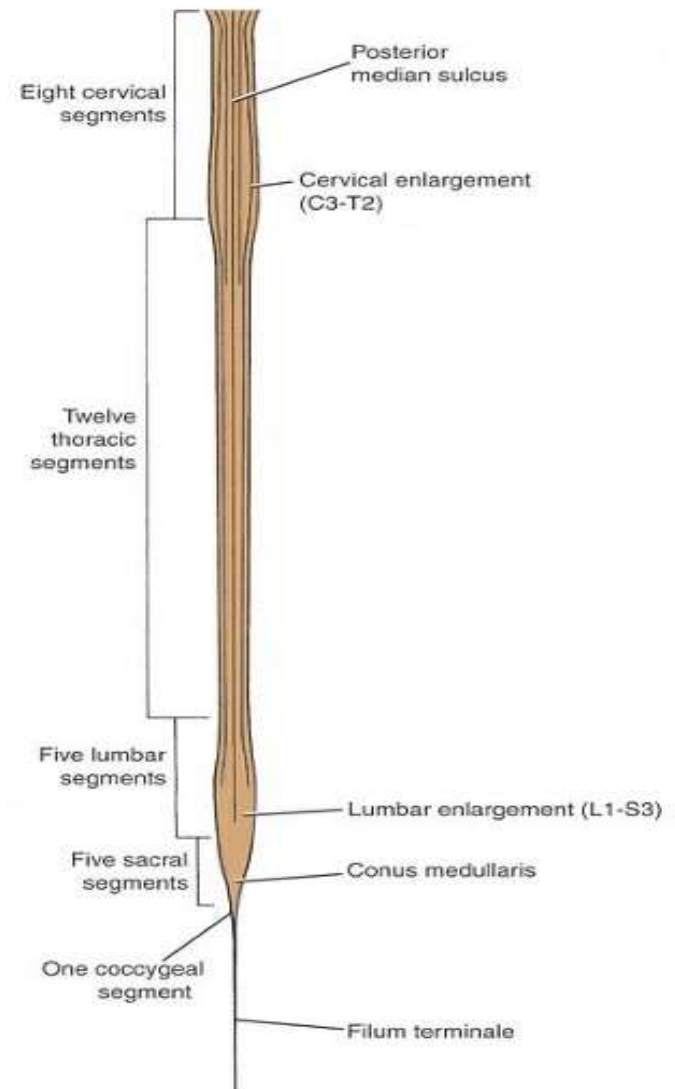
SPINAL SEGMENTS

- The part of spinal cord to which a pair of spinal nerves is attached is known as spinal segment.
- But there is no actual surface indication of segmentation.



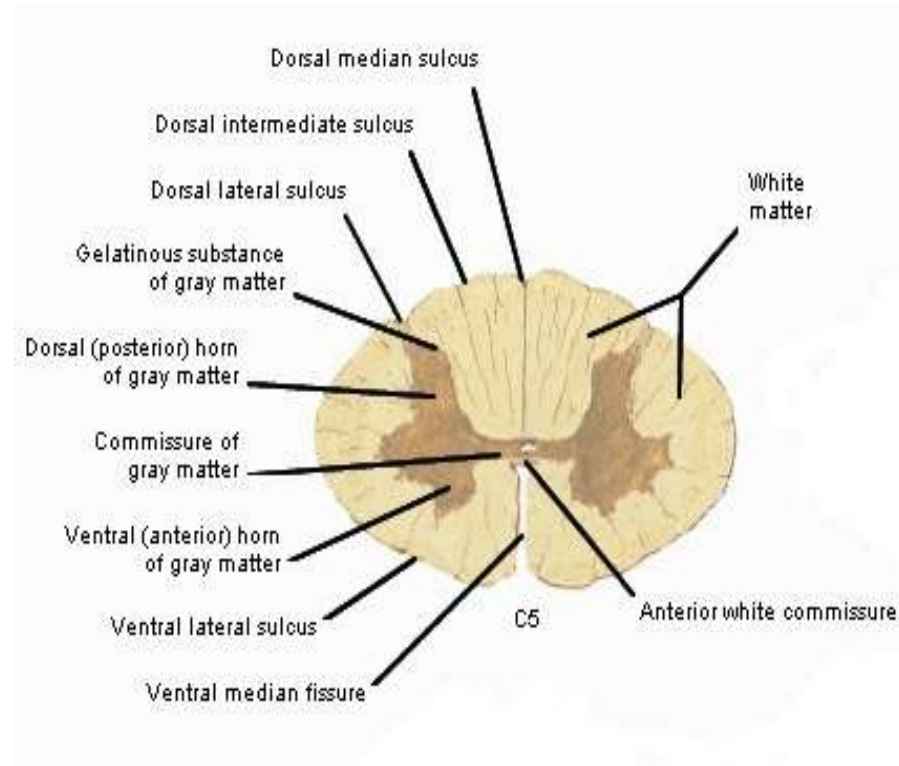
ENLARGEMENTS

- The spinal cord is roughly cylindrical in shape with an average diameter of 1.25cm.
- The spinal cord presents definite swellings called Cervical (C4-T2) & Lumbar (L2-S3) enlargements.
- These enlargements are produced due to the presence of large no. of large motor neurons in these regions.



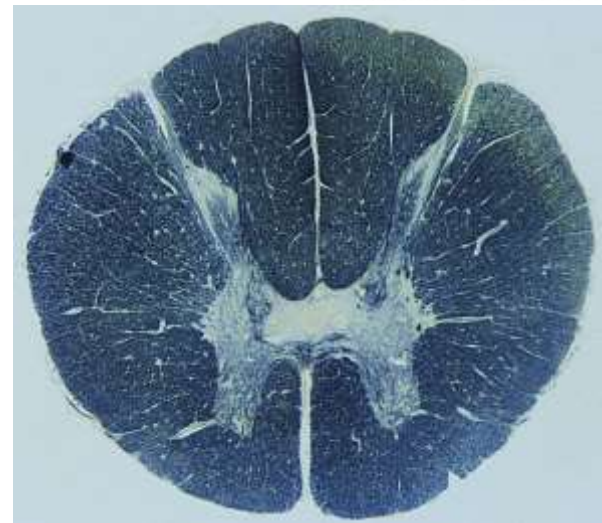
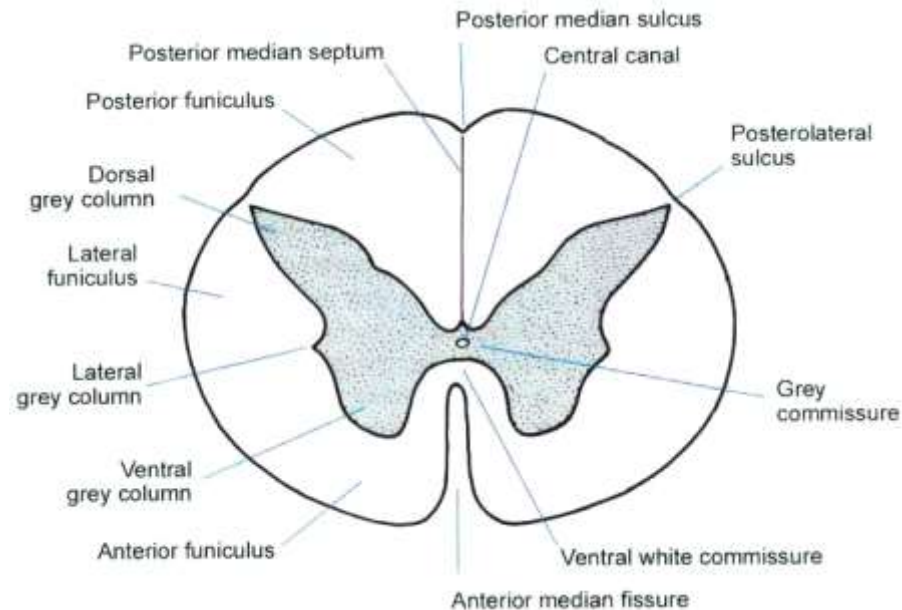
INTERNAL STRUCTURE OF THE SPINAL CORD

- H shaped gray matter which consists of cell bodies of neurons and neuroglia.
- White matter surrounds the gray and consists of myelinated and unmyelinated nerve fibers with neuroglia.
- Gray matter has anterior column/ horn and posterior horn on each side
- The central canal of the cord passes through the centre of gray commissure.



INTERNAL STRUCTURE

- White matter is divided into two halves by anterior median fissure and posterior median septum
- Each half is again divided into anterior, lateral and posterior funiculi
- Small strip of white matter connects the two halves in front of the gray commissure. This is called the white or anterior commissure.

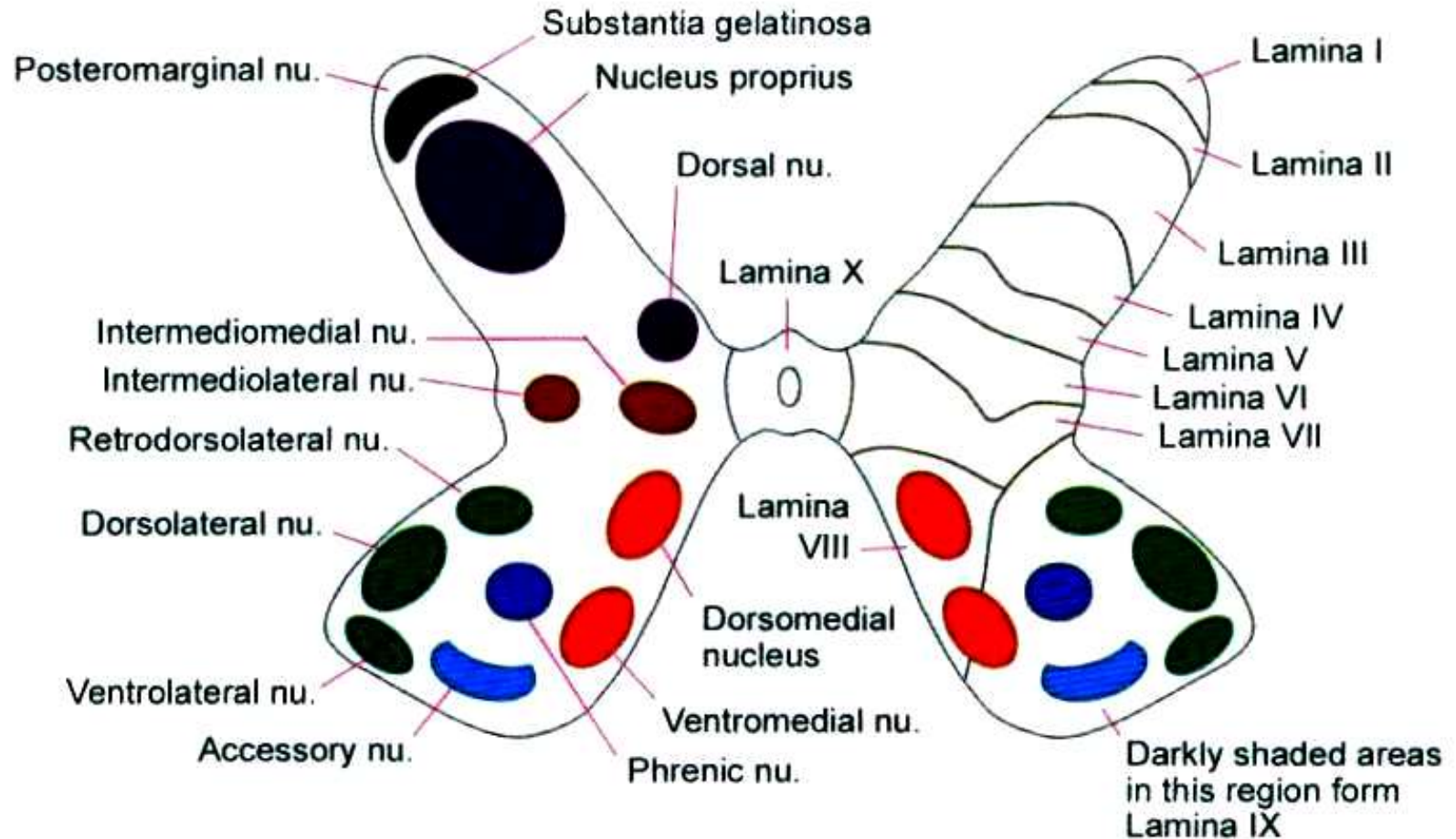


GREY MATER

- Butterfly/H shaped.
- Has cell bodies of multipolar neurons and interneurons (Renshaw cells)
- It is divided into three horns –
 - anterior (motor neuron)
 - Posterior (sensory neuron)
 - lateral (motor neuron)



NUCLEI AND LAMINAE



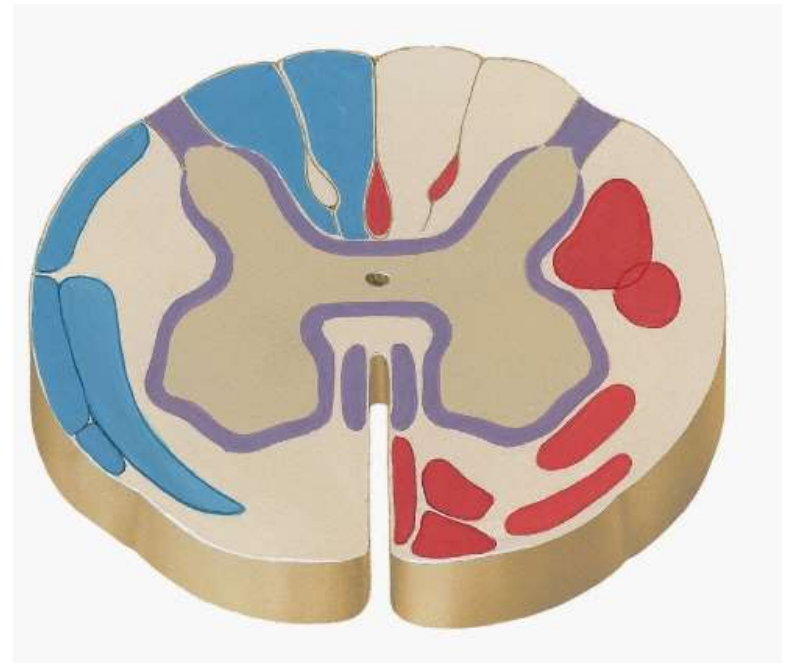
TRACTS

Major Ascending tracts

- Spinothalamic
- Fasciculus gracilis
- Fasciculus cuneatus
- Spinocerebellar

Major Descending tracts

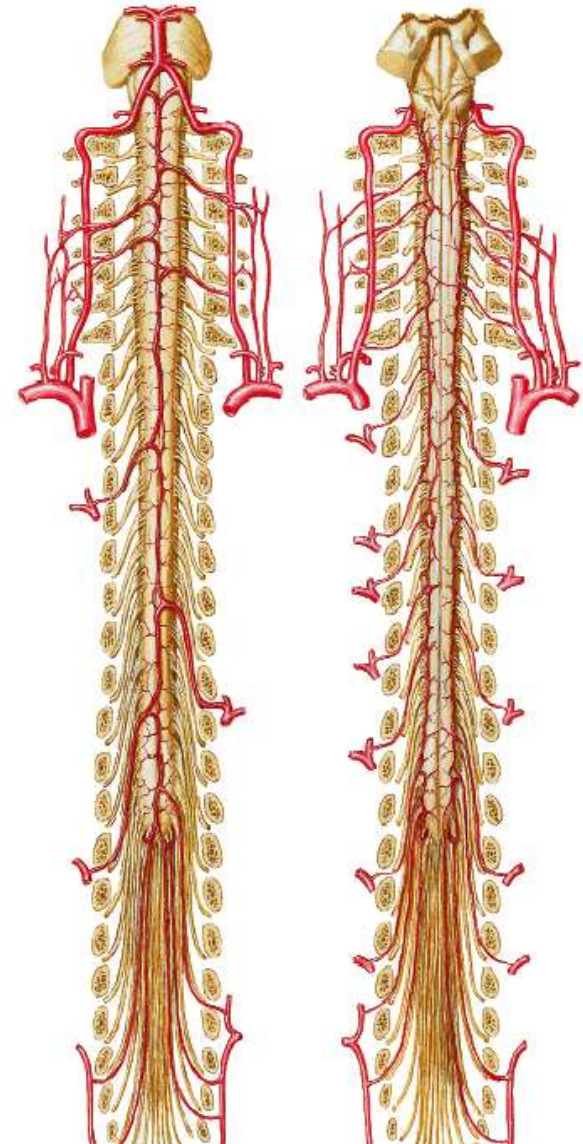
- Cortico spinal
- Rubro spinal
- Reticulo spinal



BLOOD SUPPLY

Arteries of Spinal Cord - Schema

- Anterior spinal artery
- Two posterior spinal arteries
- Segmental arteries



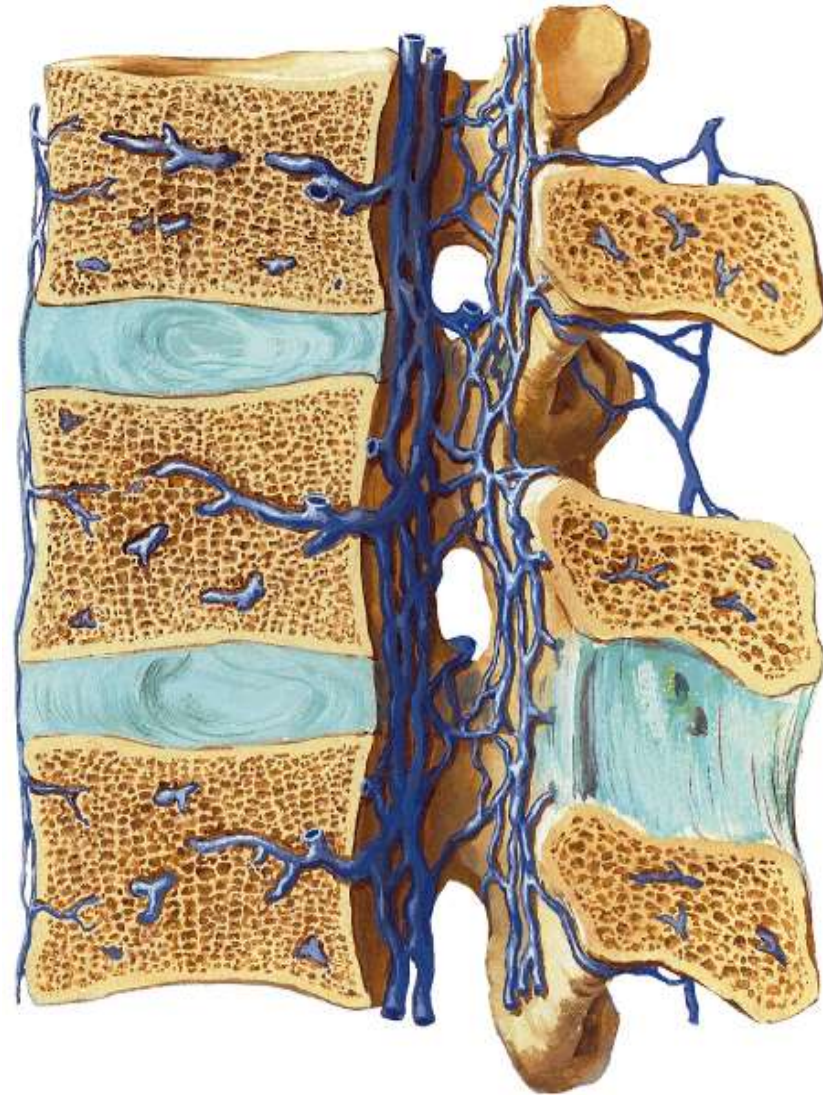
- **Venous drainage:**

Form 6 longitudinal venous channel around the cord.

- Two median longitudinal
- Two anterolateral
- Two posterolateral

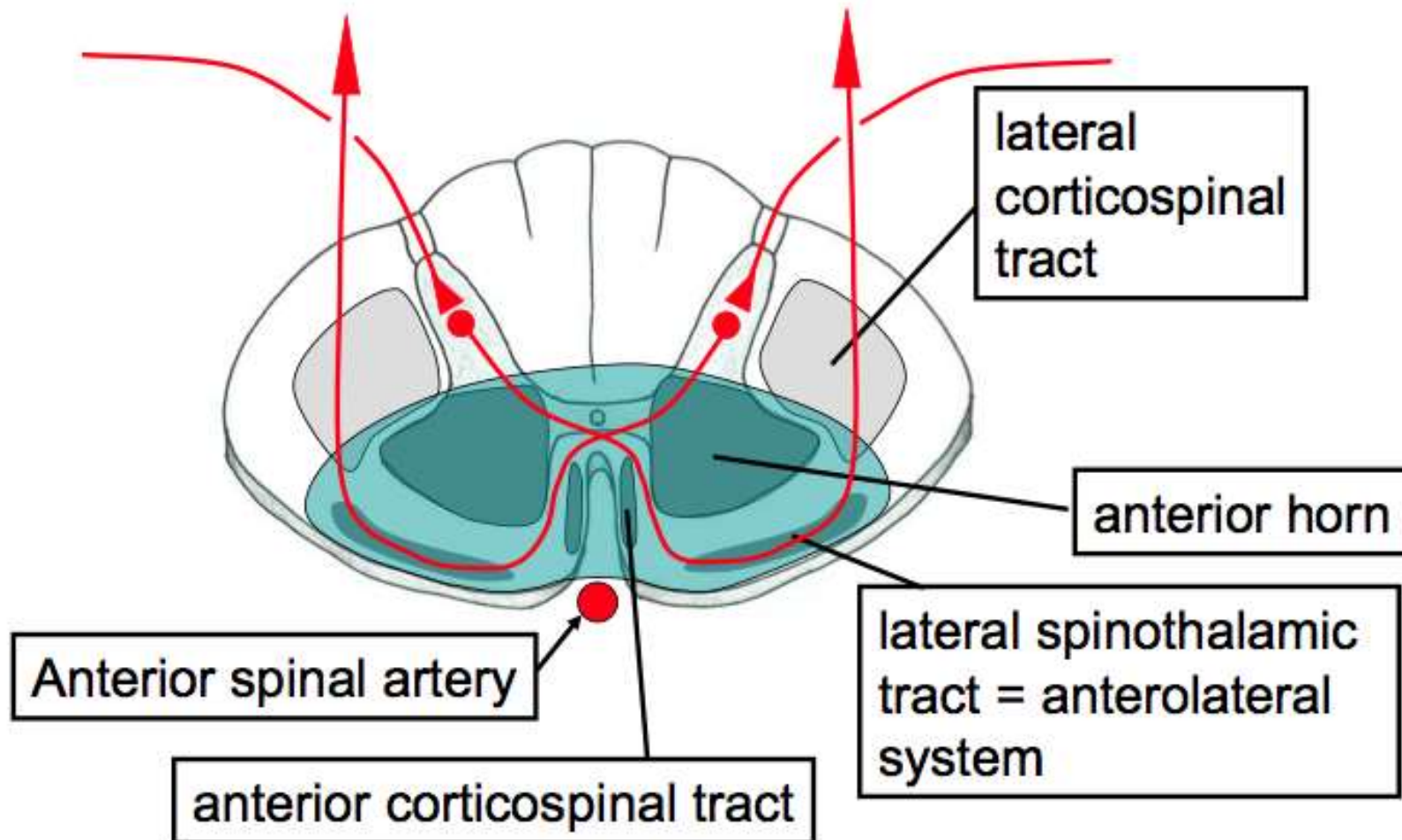
↓
Internal vertebral venous plexus

↓
Basilar venous plexus

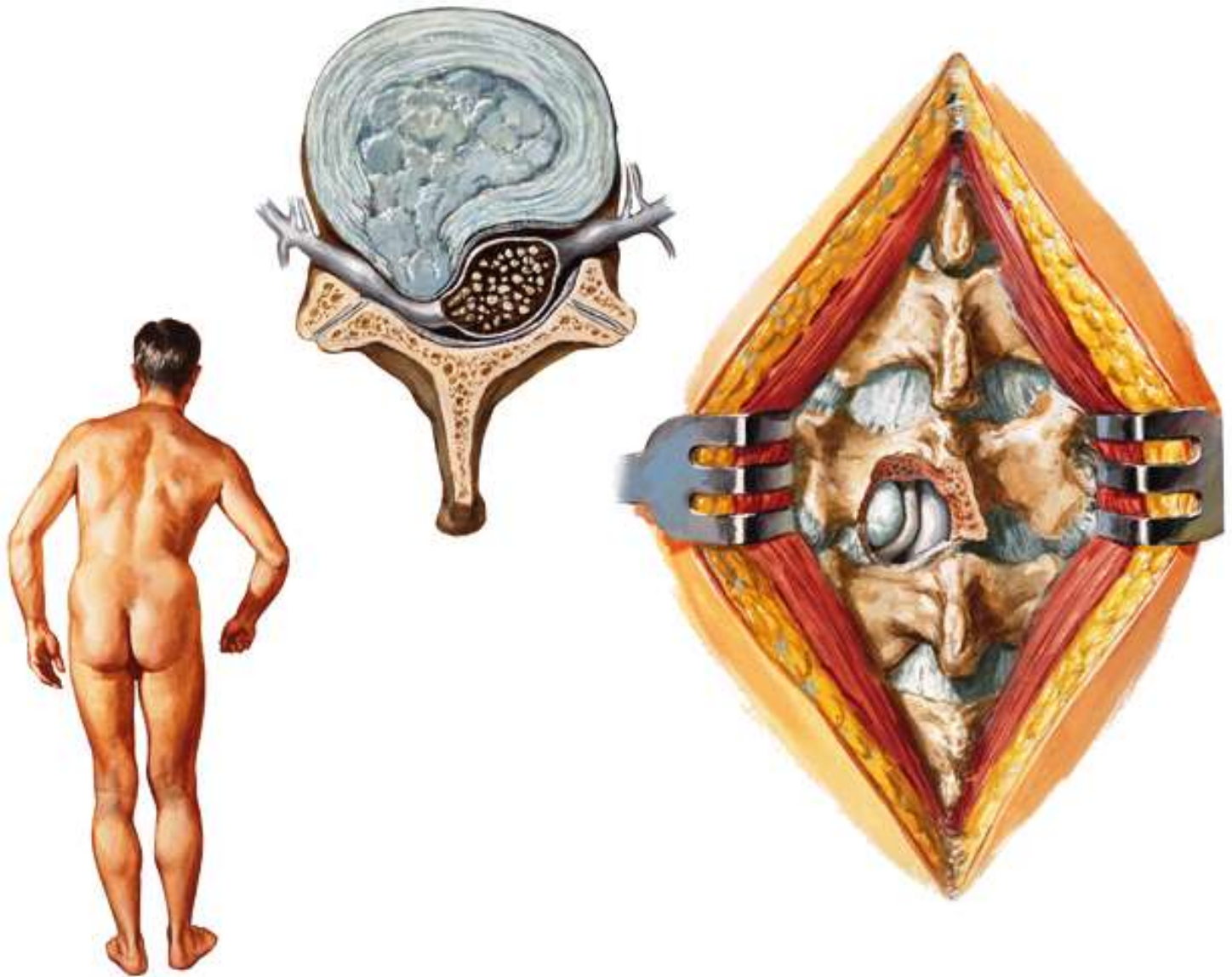


CLINICAL ANATOMY

Anterior Spinal Artery Syndrome



LUMBAR DISC HERNIATION

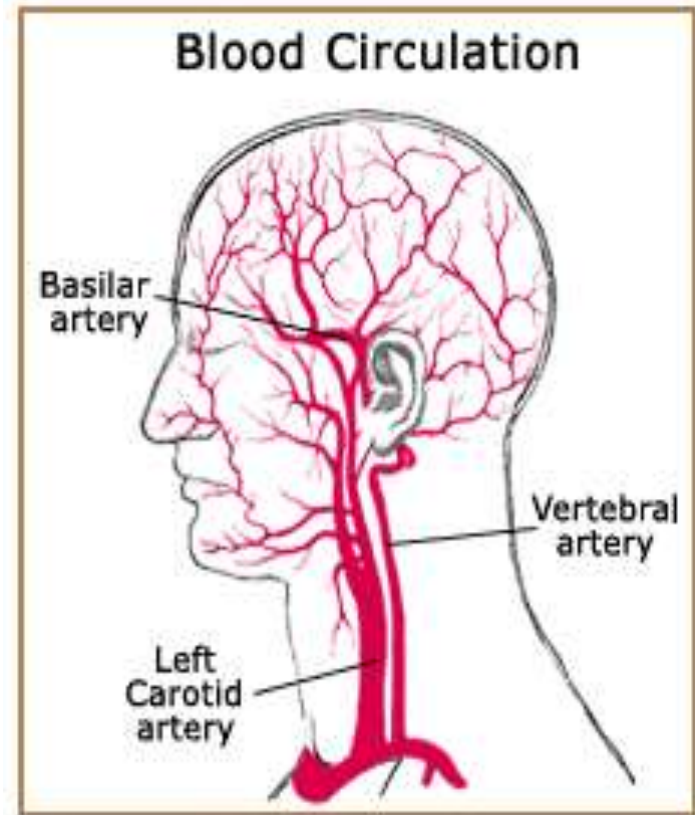




BLOOD SUPPLY OF THE BRAIN

Blood Supply of The Brain

- The brain receives its arterial supply from two pairs of vessels, the **vertebral** and **internal carotid arteries** which are interconnected in the cranial cavity to produce an **arterial circle (of Willis)**.

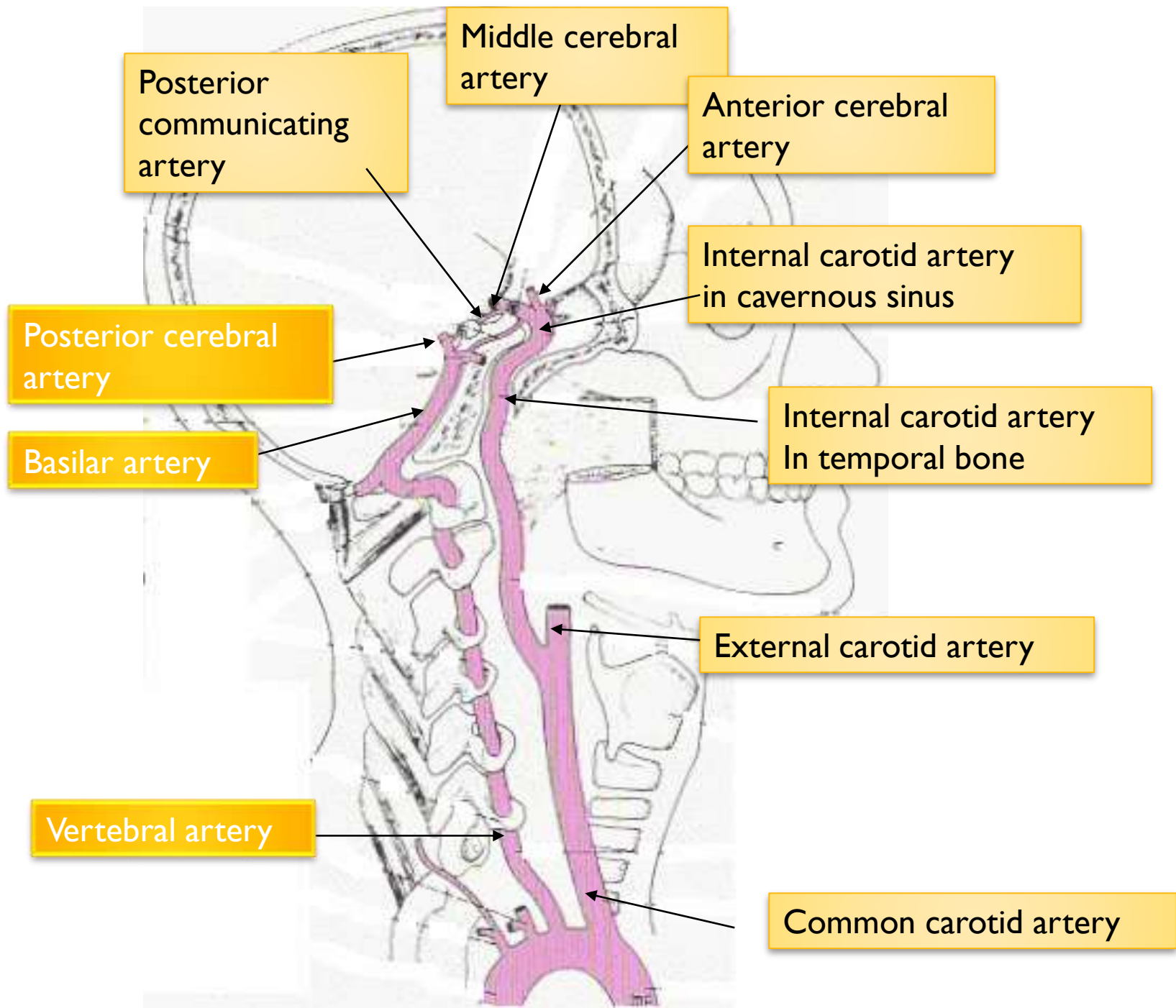


Internal Carotid Artery

- Begins – at bifurcation of common carotid artery
- Perforates base of skull – enters into carotid canal
- Enters middle cranial fossa beside dorsum sellae
- In the cavernous sinus
 - Horizontal
- Emerge out – medial side of Anterior clinoid process – perforates dura & arachnoid mater – enters subarachnoid space
- Turns posteriorly – below optic nerve
- Turns upward – lateral to optic chiasma
- Now is under anterior perforated substance
- Divides – into **ANTERIOR & MIDDLE** cerebral arteries.

Vertebral Artery

- Branch of first part of subclavian A
- Passes – foramen transvesarium C6 – C1
- Enters through foramen magnum – perforates dura & arachnoid mater – enters subarachnoid space
- Turns upward, forward, medially – medulla oblongata
- Lower border of pons – joins opposite side
 - **BASILAR** artery



Branches of :-

INTERNAL CAROTID ARTERY

- Anterior cerebral artery
- Middle cerebral artery
- Ophthalmic artery
- Ant Com artery
- Post Com artery
- Choroidal artery

VERTEBRAL ARTERY

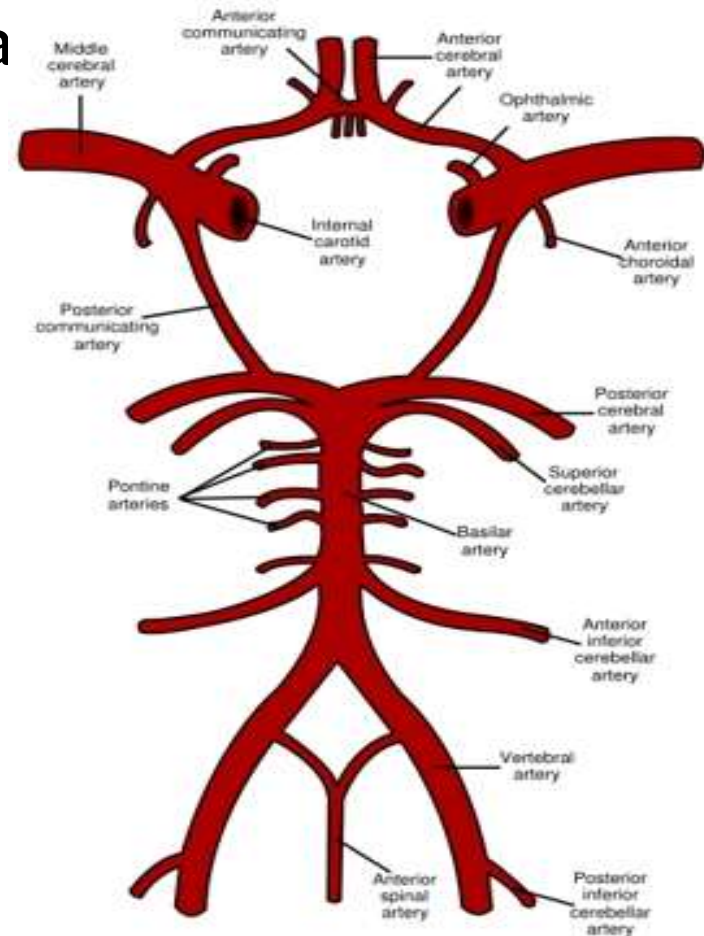
- Meningeal
- Post Spinal
- Ant Spinal
- Post Inf Cerebellar
- Medullary

BASILAR ARTERY

- Pontine
- Labyrinthine
- Ant Inf Cerebellar
- Sup Cerebellar
- Post Cerebral artery

Circle of Willis

- Interpeduncular fossa
– base of brain
- Anastomosis
 - 2 internal carotid arteries
 - 2 vertebral arteries
- In the subarachnoid space



INFERIOR VIEW

Anterior communicating artery

Anterior cerebral artery

Middle cerebral artery

Internal carotid artery

Posterior communicating artery

Posterior cerebral artery

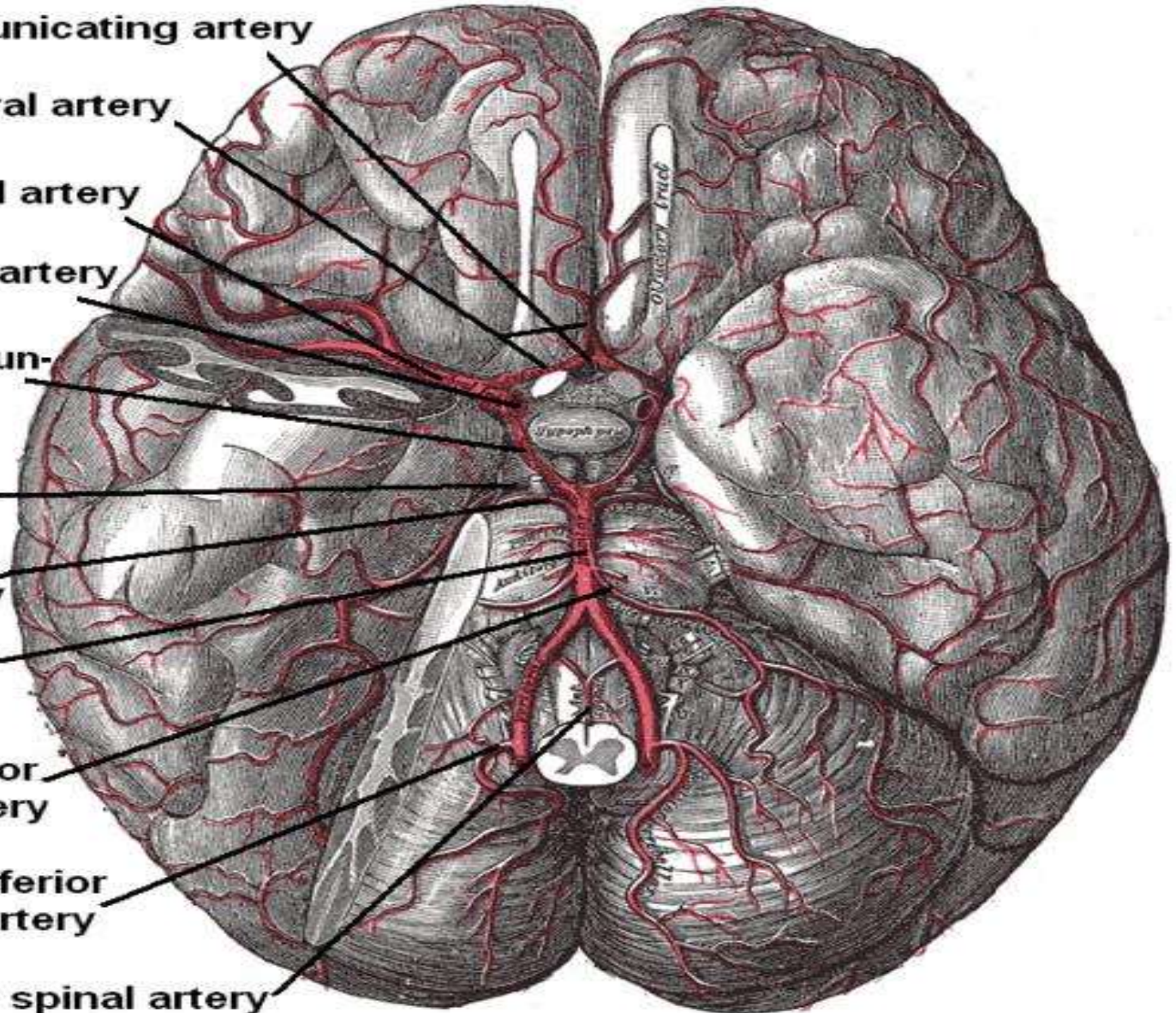
Superior cerebellar artery

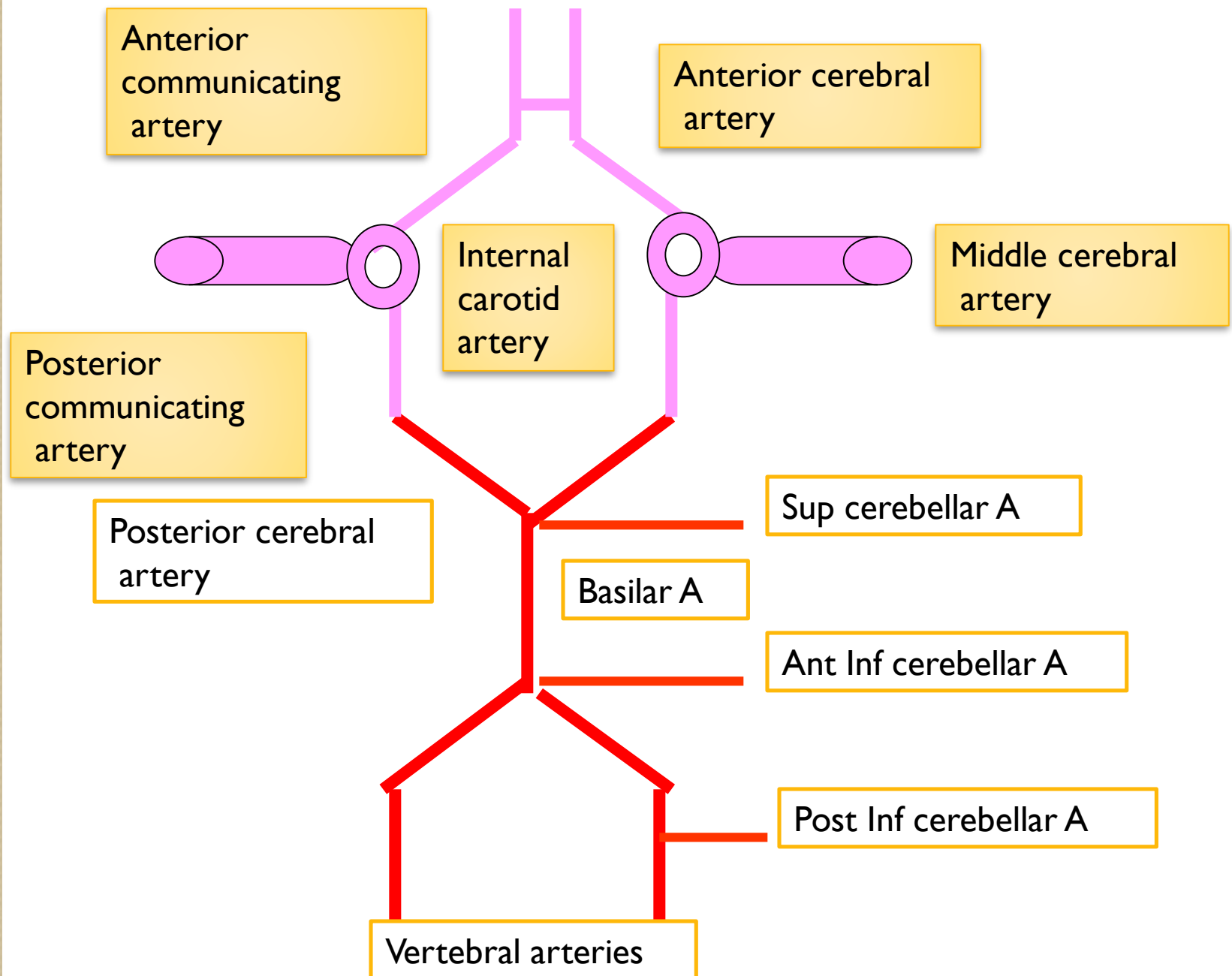
Basilar artery

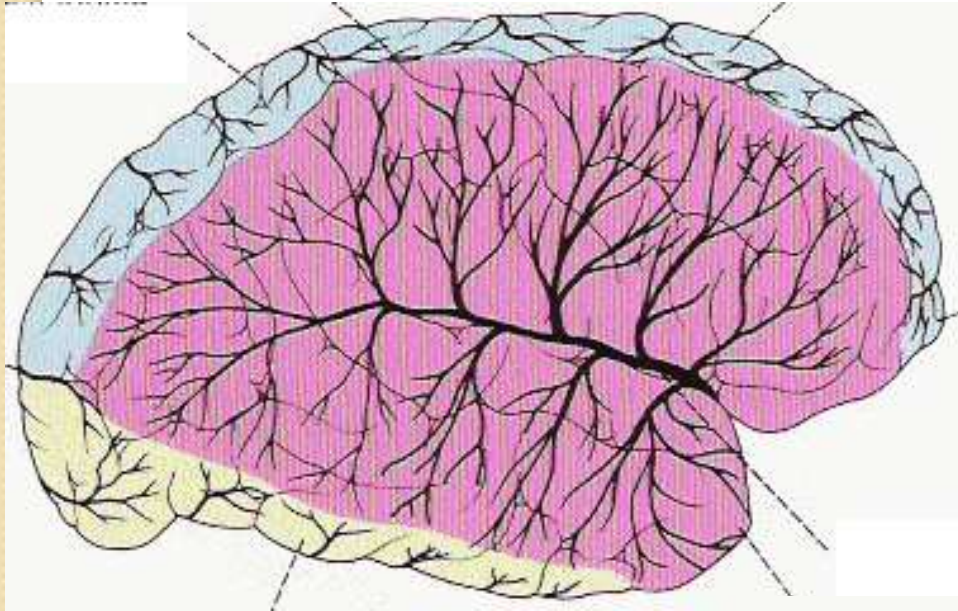
Anterior inferior cerebellar artery

Posterior inferior cerebellar artery

Anterior spinal artery



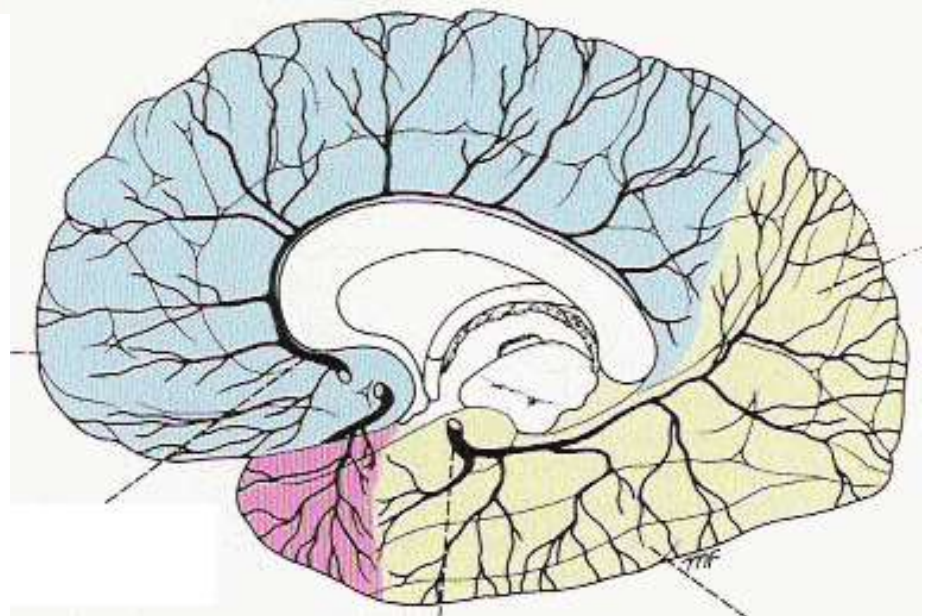




Anterior cerebral artery

Middle cerebral artery

Posterior cerebral artery





THANK YOU