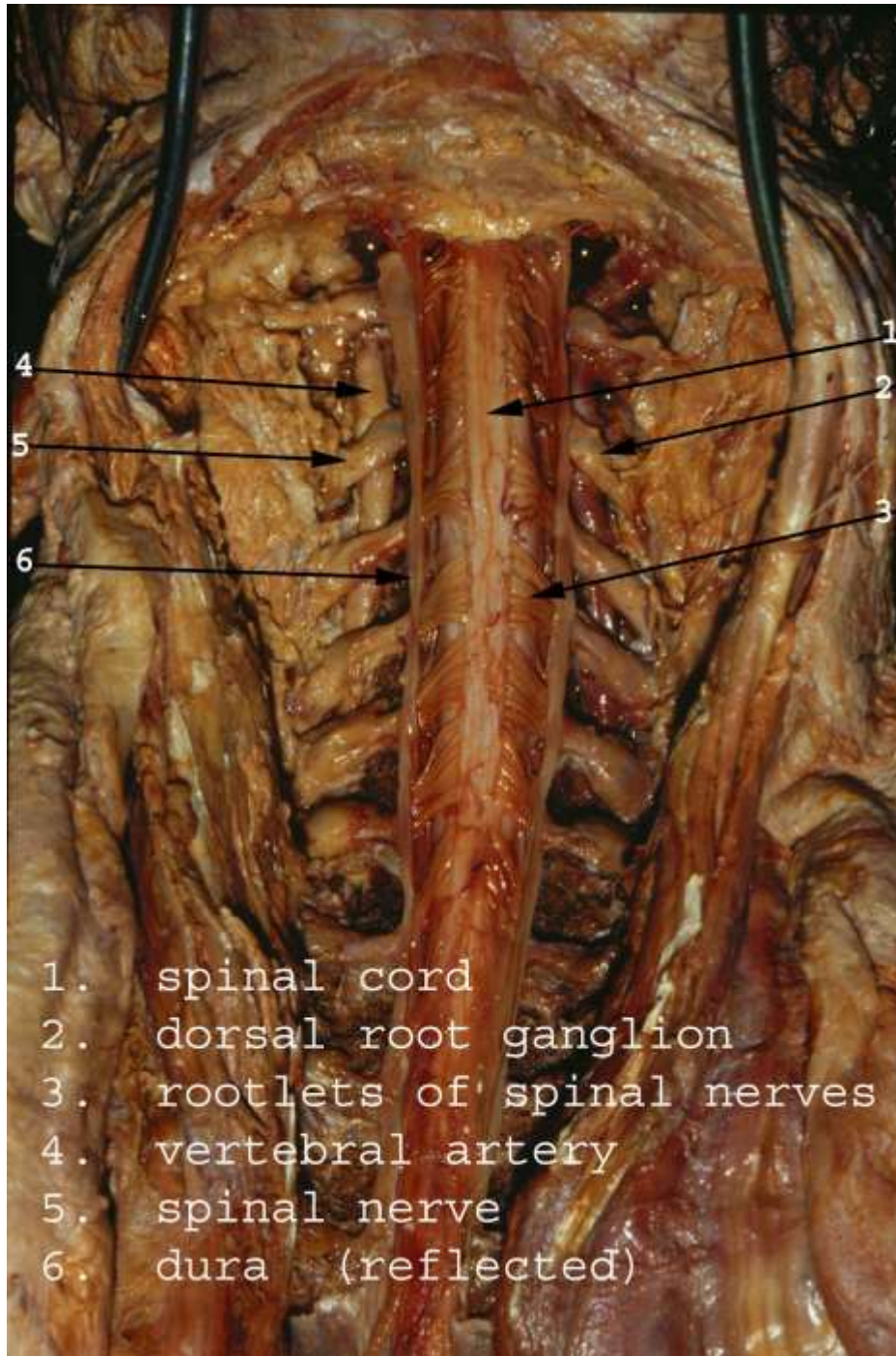


VERTEBRAL CANAL-II



Presented by :- Dr. Sushma Tomar
Associate Professor
Department of Anatomy



Spinal Cord

1. spinal cord
2. dorsal root ganglion
3. rootlets of spinal nerves
4. vertebral artery
5. spinal nerve
6. dura (reflected)

Lesson Plan

- **Introduction**
- **External Features**
- **Fissures & Sulci**
- **Attachments of spinal nerve roots**
- **Course of spinal nerve roots**
- **Cauda Equina**
- **Exit of spinal nerves**
- **Spinal ganglia**
- **Spinal Segments**
- **Internal Structure**
- **Comparison of spinal segments**
- **Arterial supply**

Introduction

- It is a long cylindrical part of central nervous system.

Location-

- It occupies upper 2/3rd of vertebral canal.

Beginning-

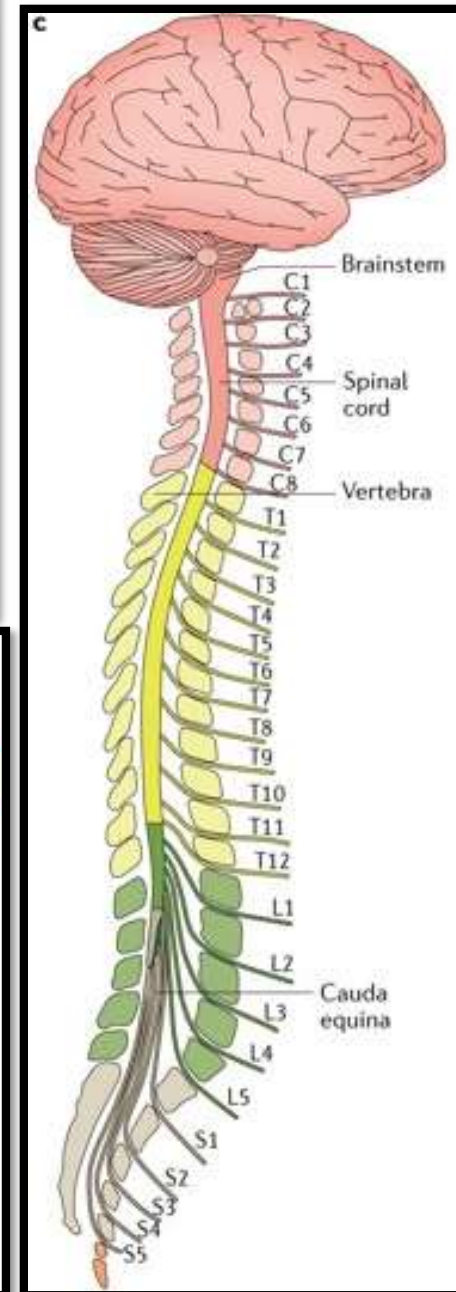
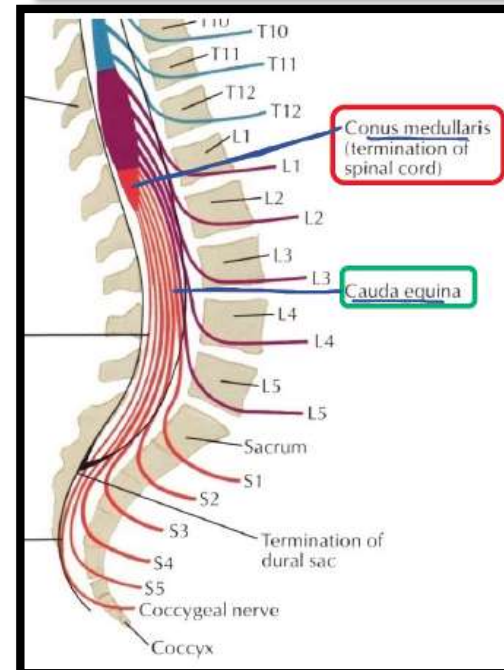
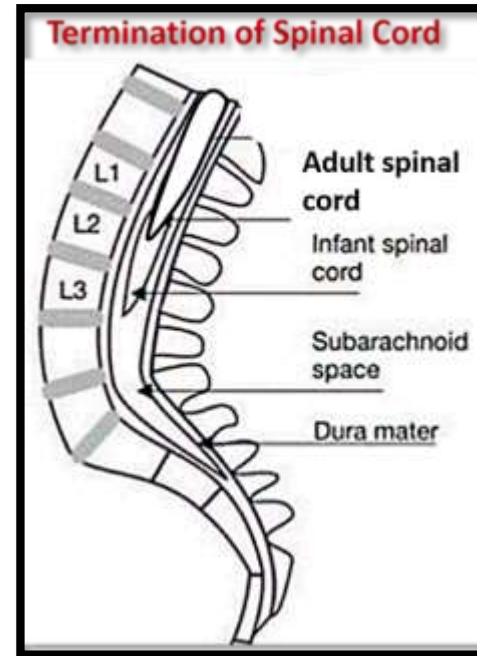
- At Foramen magnum, as continuation of Medulla Oblongata.

Termination-

- Opposite the intervertebral disc between L1 and L2 vertebrae.

In Infant-

- At the level of lower border of L3 vertebra.



External Features

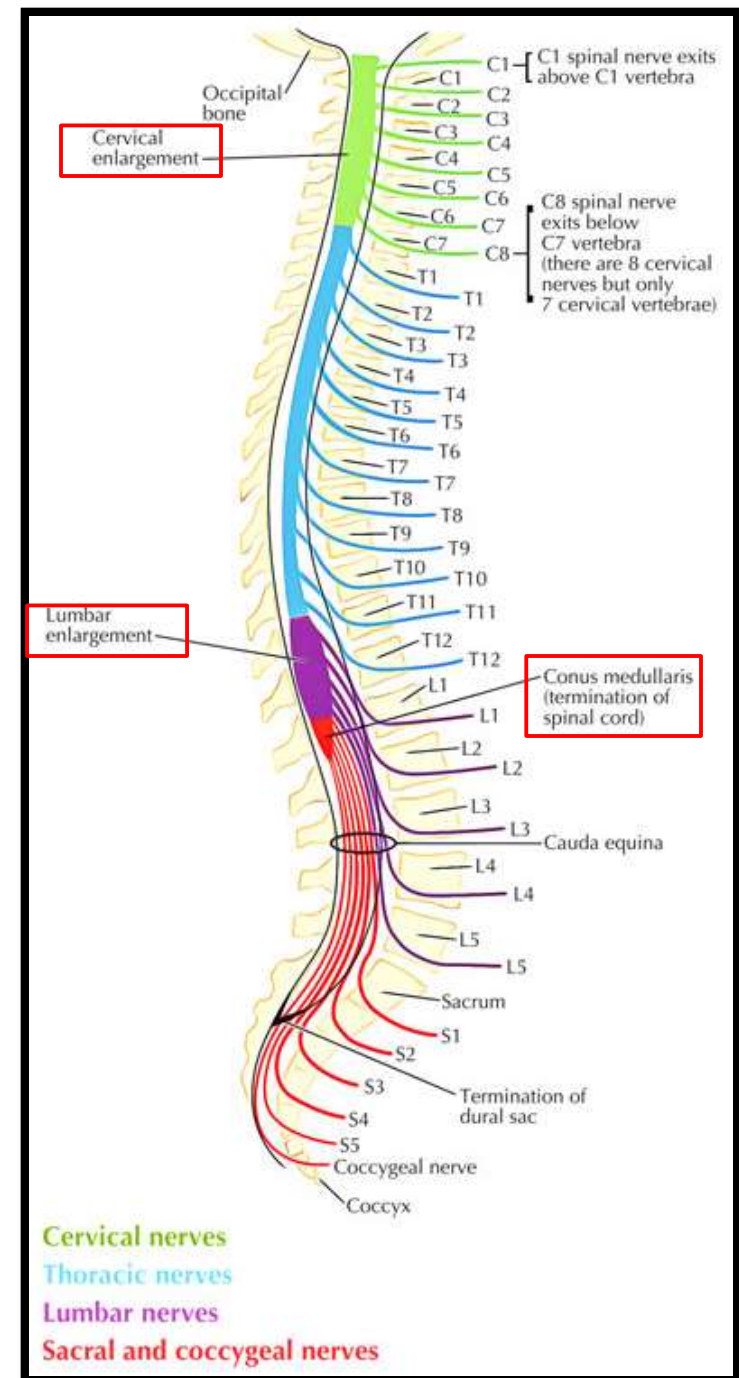
- Lower end of spinal cord is conical and known as **Conus Medullaris**.
- Spinal cord gives origin to **31 pairs** of spinal nerves (**8** Cervical, **12** Thoracic, **5** Lumbar, **5** Sacral and **1** Coccygeal).

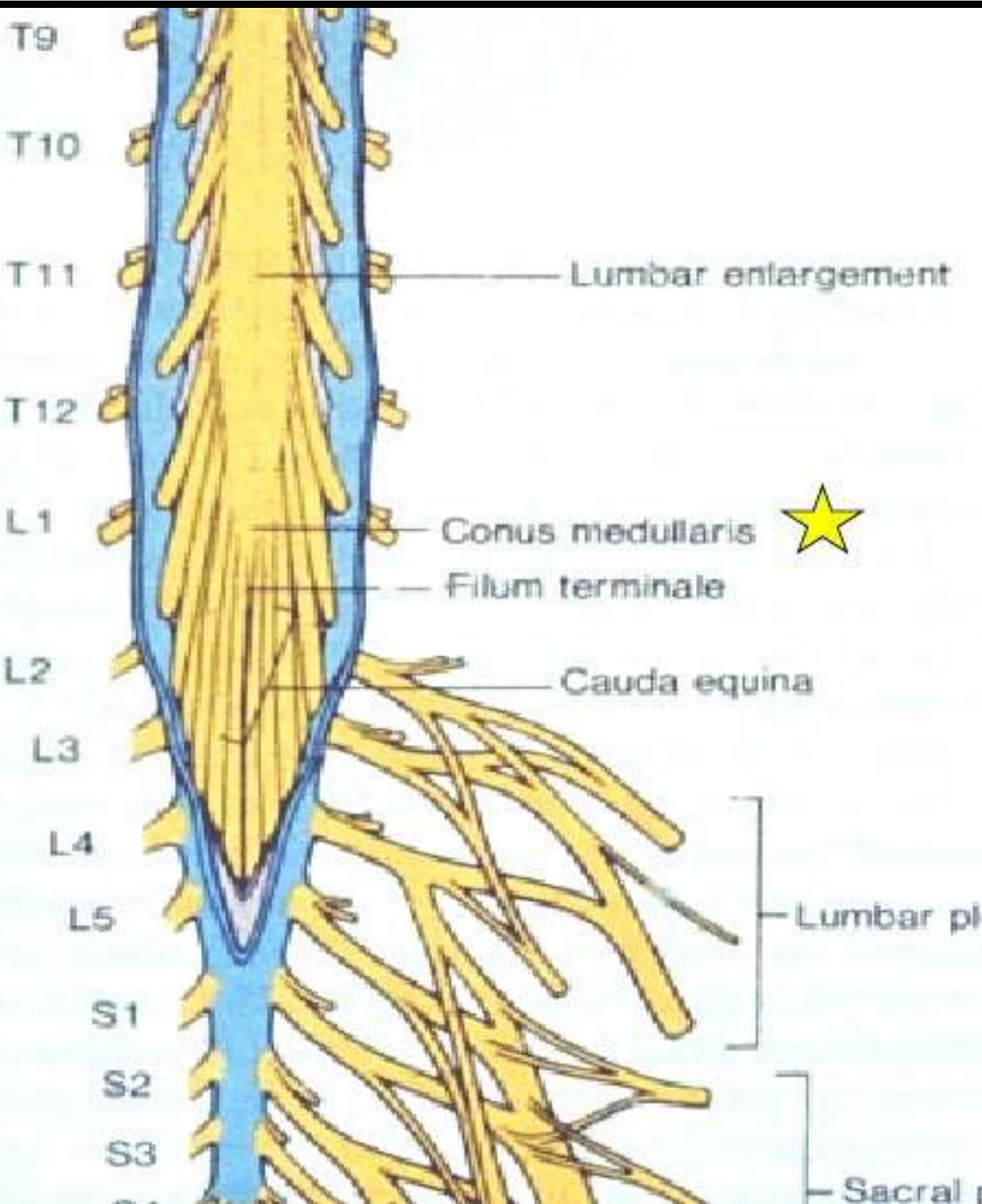
Cervical Enlargement-

- In cervical region, the girth of spinal cord increases to give origin to large nerves of upper limb.

Lumbar Enlargement-

- In lumbar region, the girth of spinal cord increases to give origin to large nerves of lower limb.





The tapering end of the spinal cord is called the **conus medullaris**.

The conus medullaris is surrounded by **L1** in an adult and **L2** in a child.

Fissures & Sulci

Anterior Median Fissure-

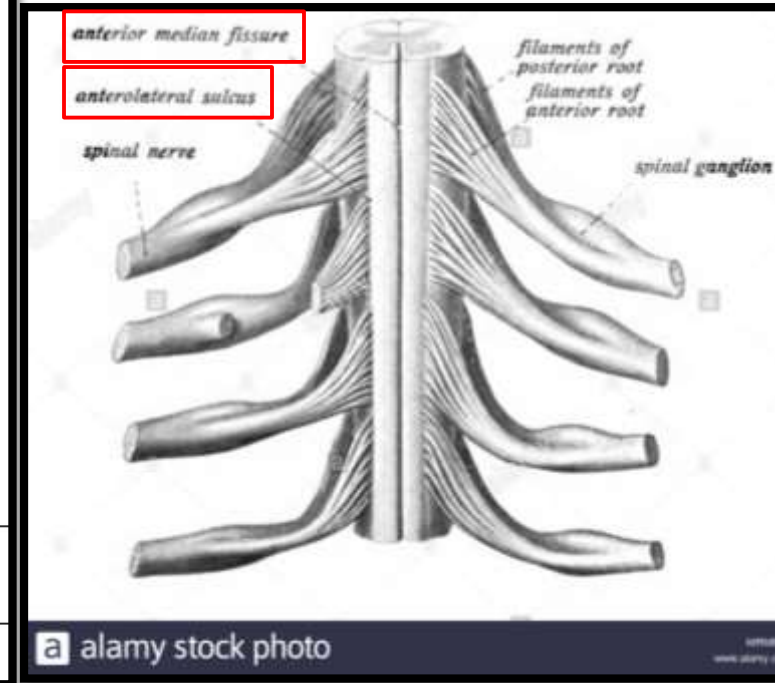
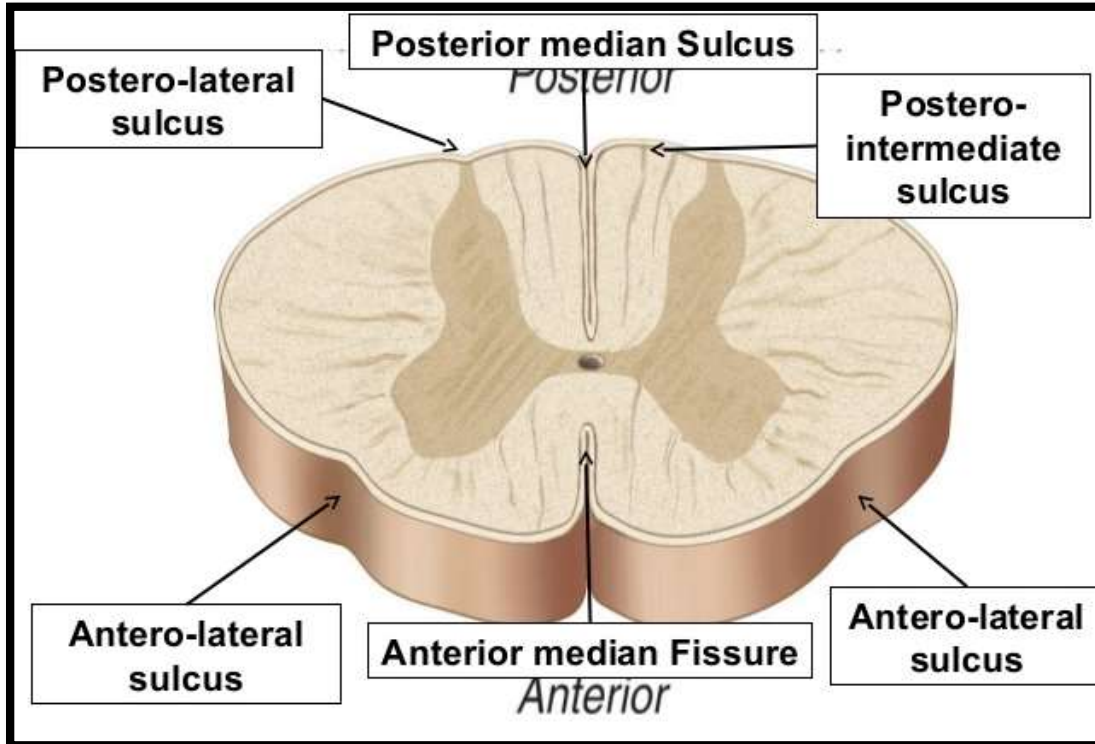
- It is a deep midline groove on anterior aspect of spinal cord.
- It extends along the entire length of spinal cord.

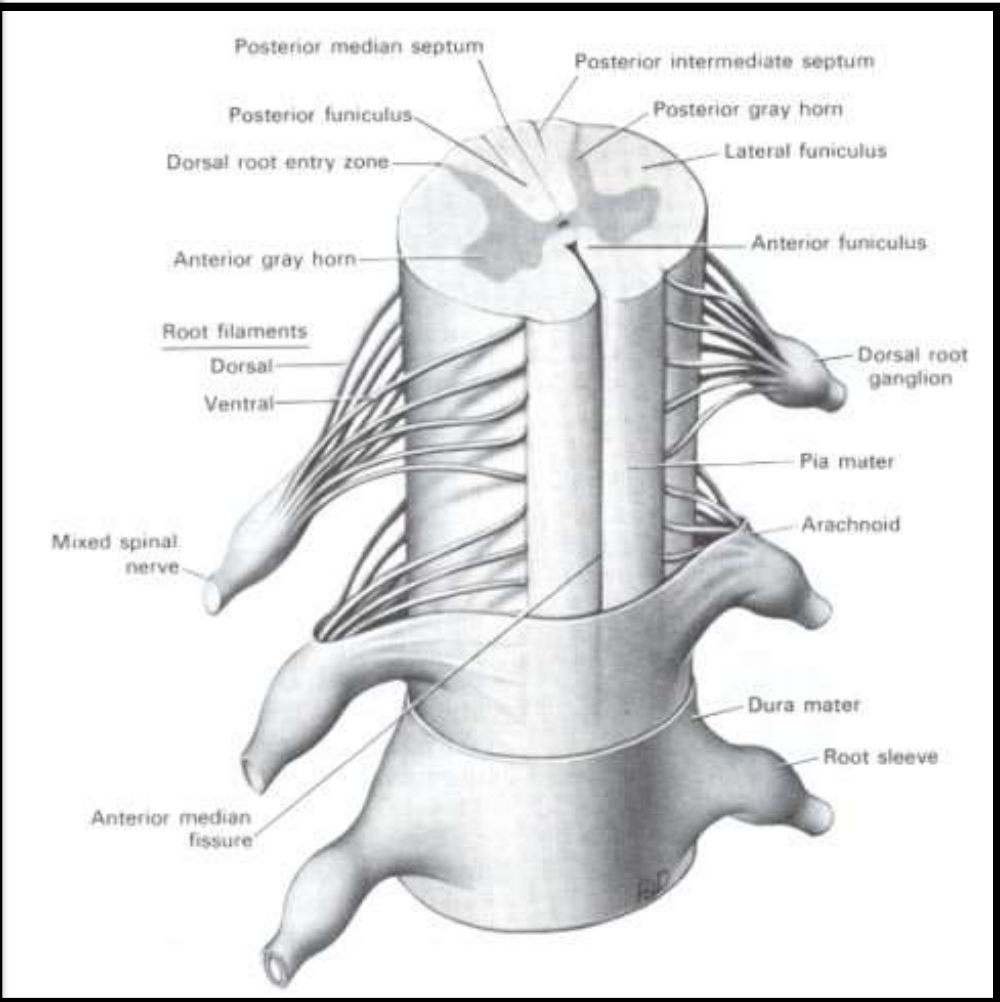
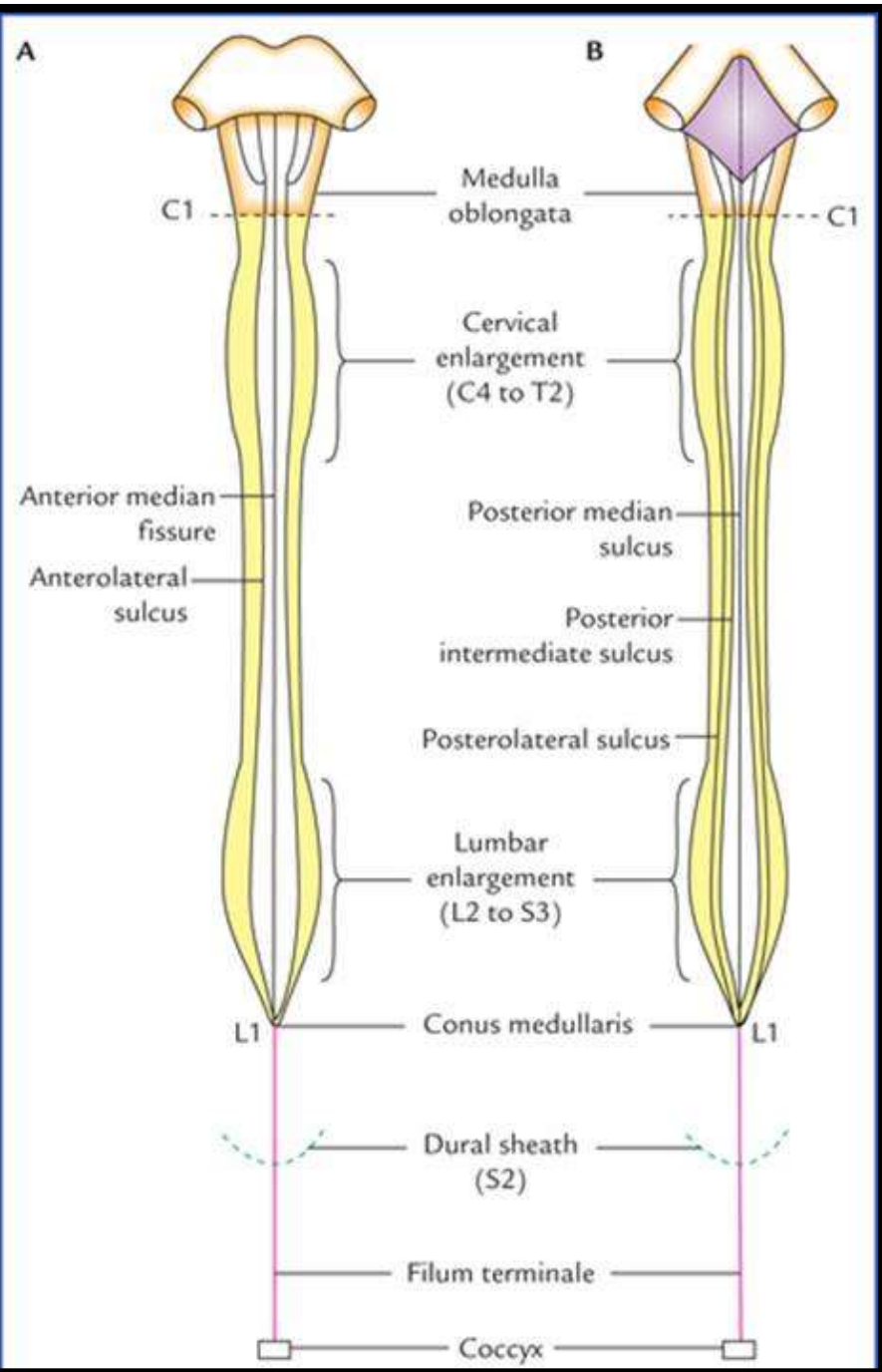
Anterolateral Sulci-

- These are present on either side of anterior median fissure.

Posterior Median Sulcus-

- It is a shallow midline sulcus on posterior aspect of spinal cord.





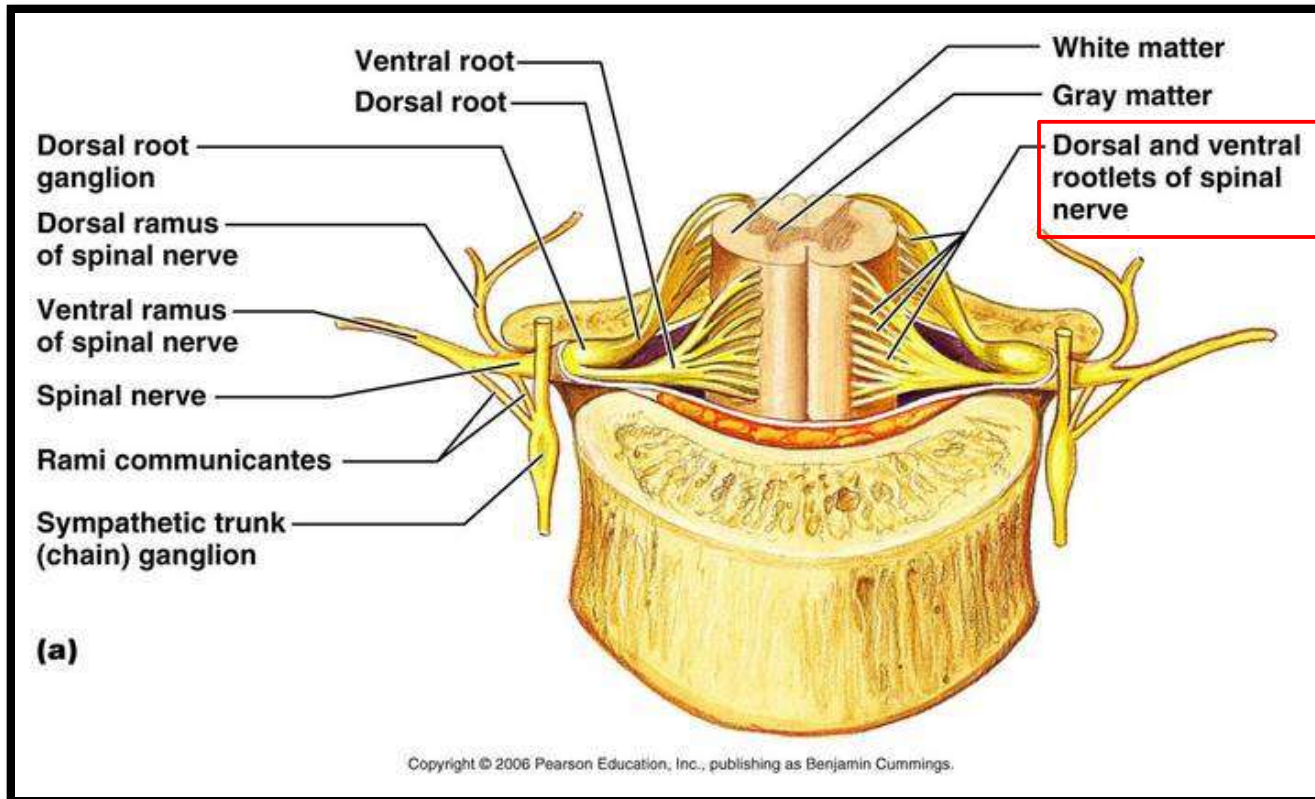
Attachments of Spinal Nerve Roots

Anterior root-

- It is formed by 3 or 4 rootlets.
- These rootlets emerge along the **anterolateral sulcus** of spinal cord.

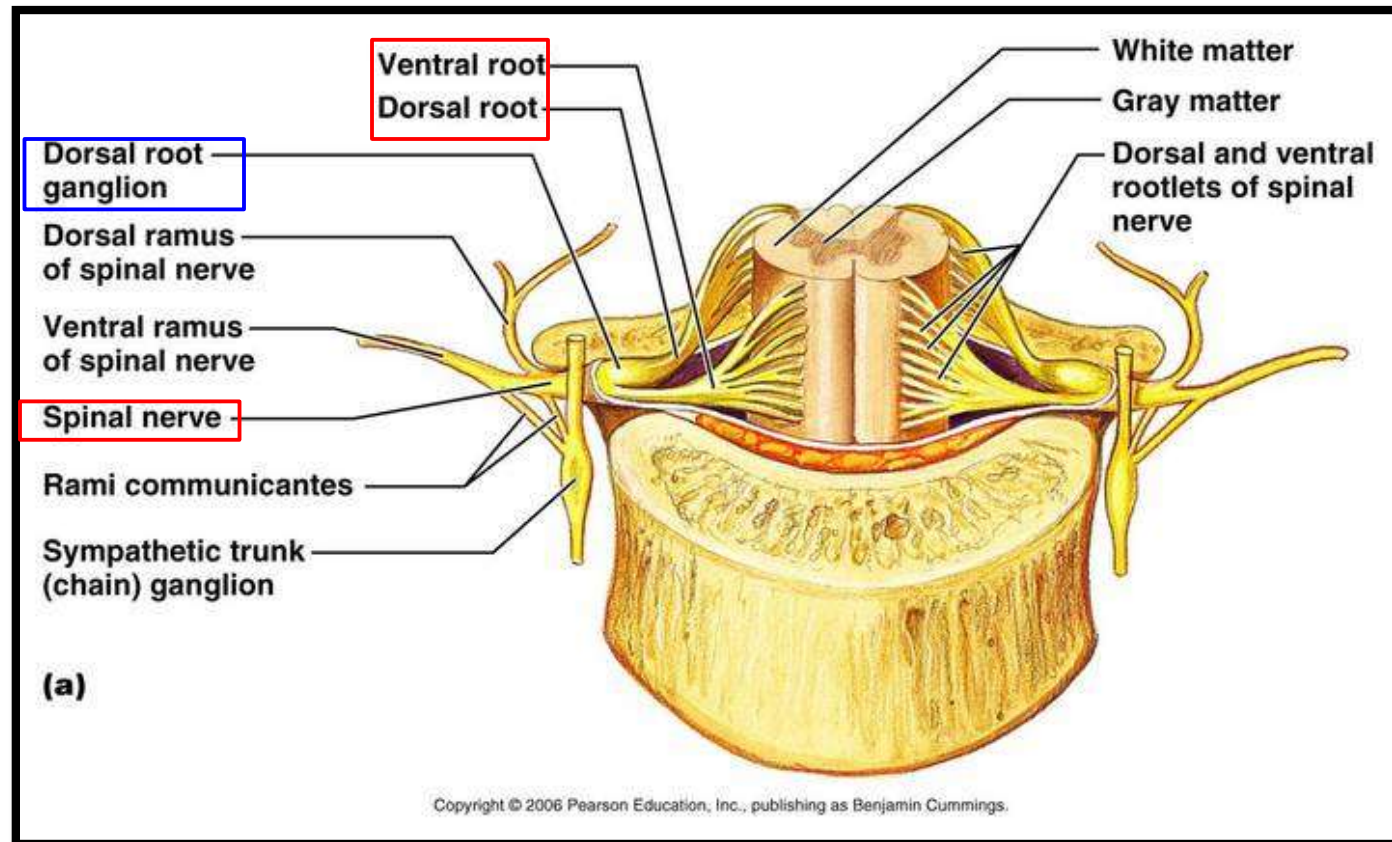
Posterior root-

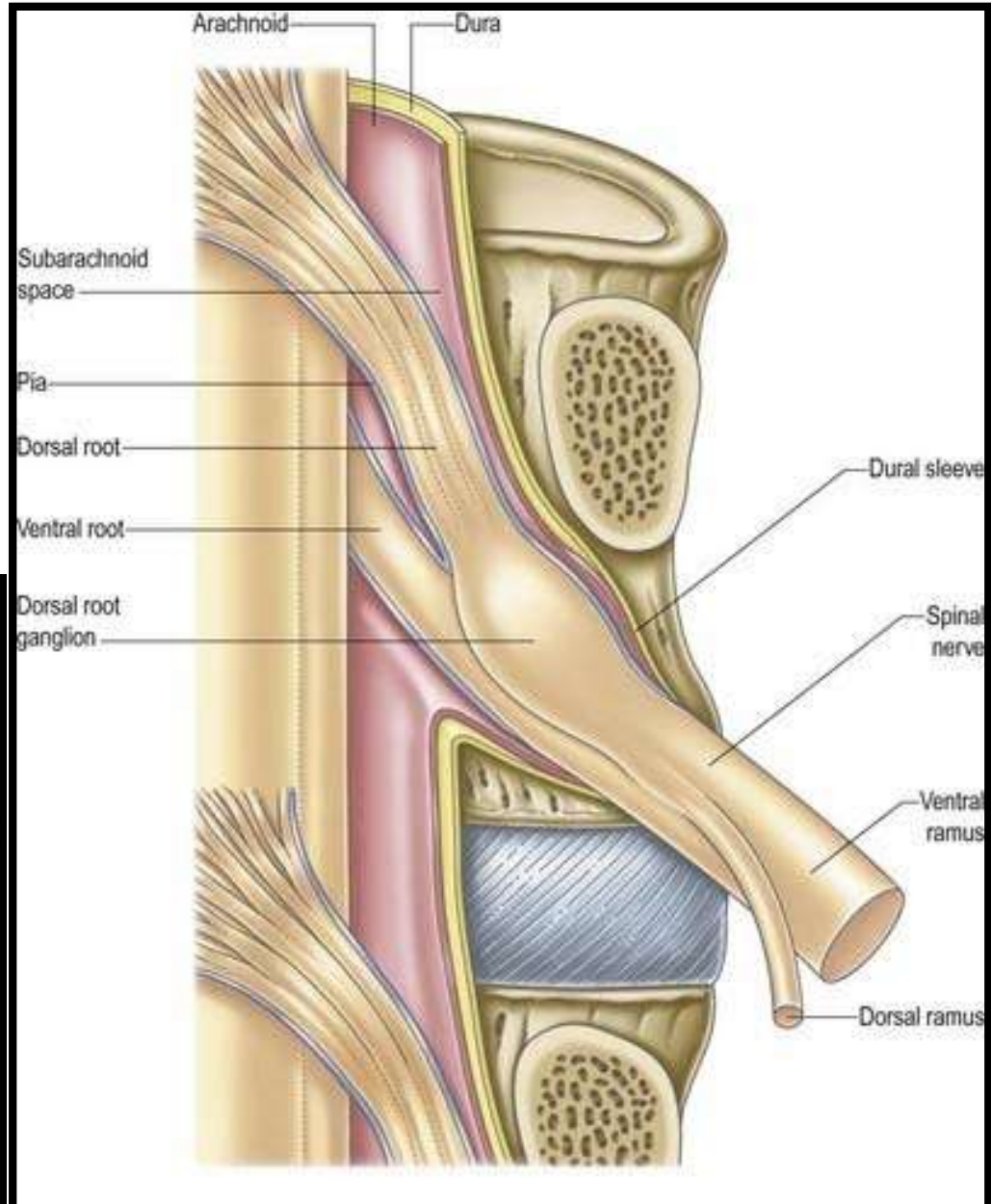
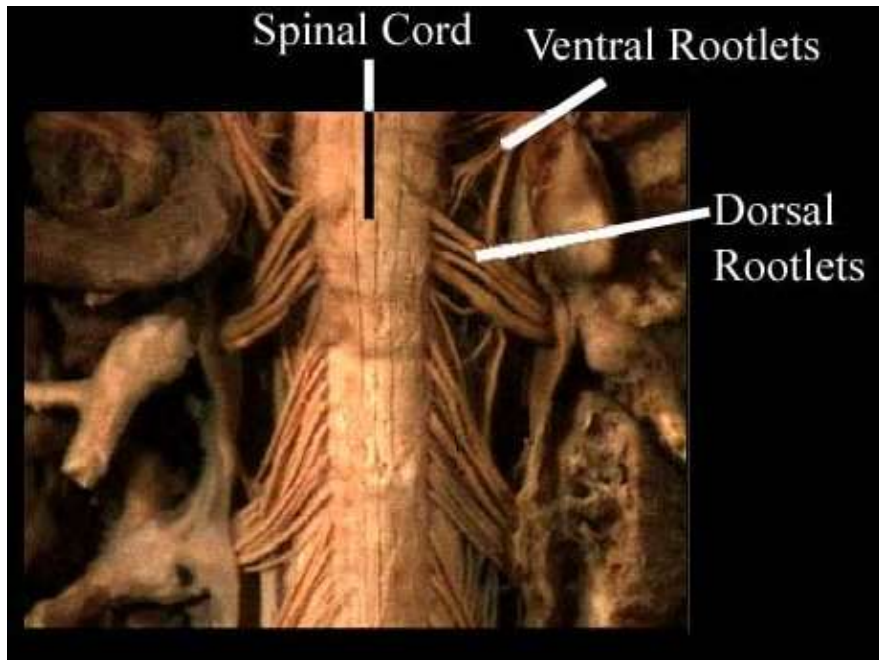
- It is formed by several rootlets.
- These rootlets are attached to the **posterolateral sulcus**.



Attachments of Spinal Nerve Roots contd...

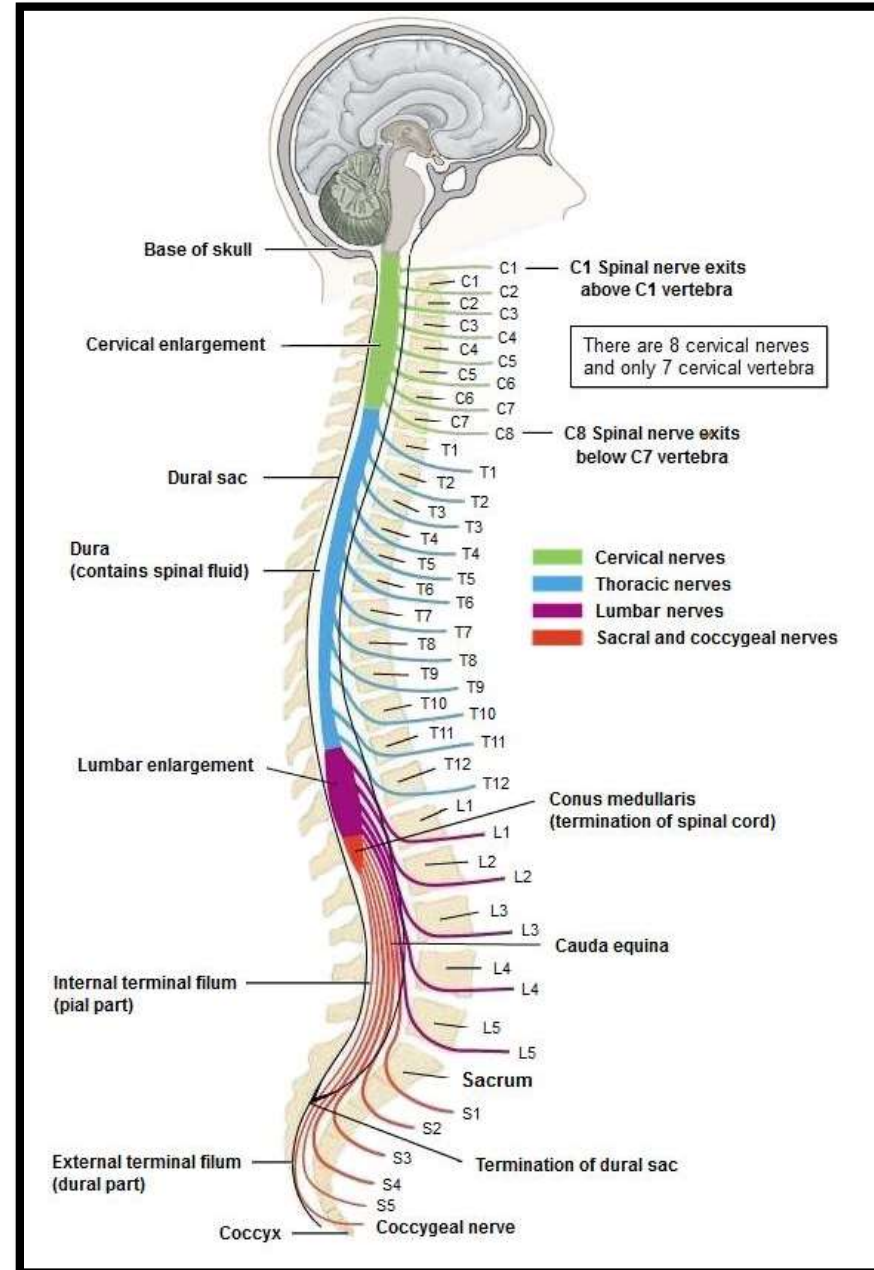
- Rootlets unite to form a single root.
- Anterior and posterior roots pass to the intervertebral foramen.
- In the intervertebral foramen, both roots evaginate the dura separately and unite to form the trunk of spinal nerve.
- **Dorsal Root Ganglion (DRG)** lies in intervertebral foramen.



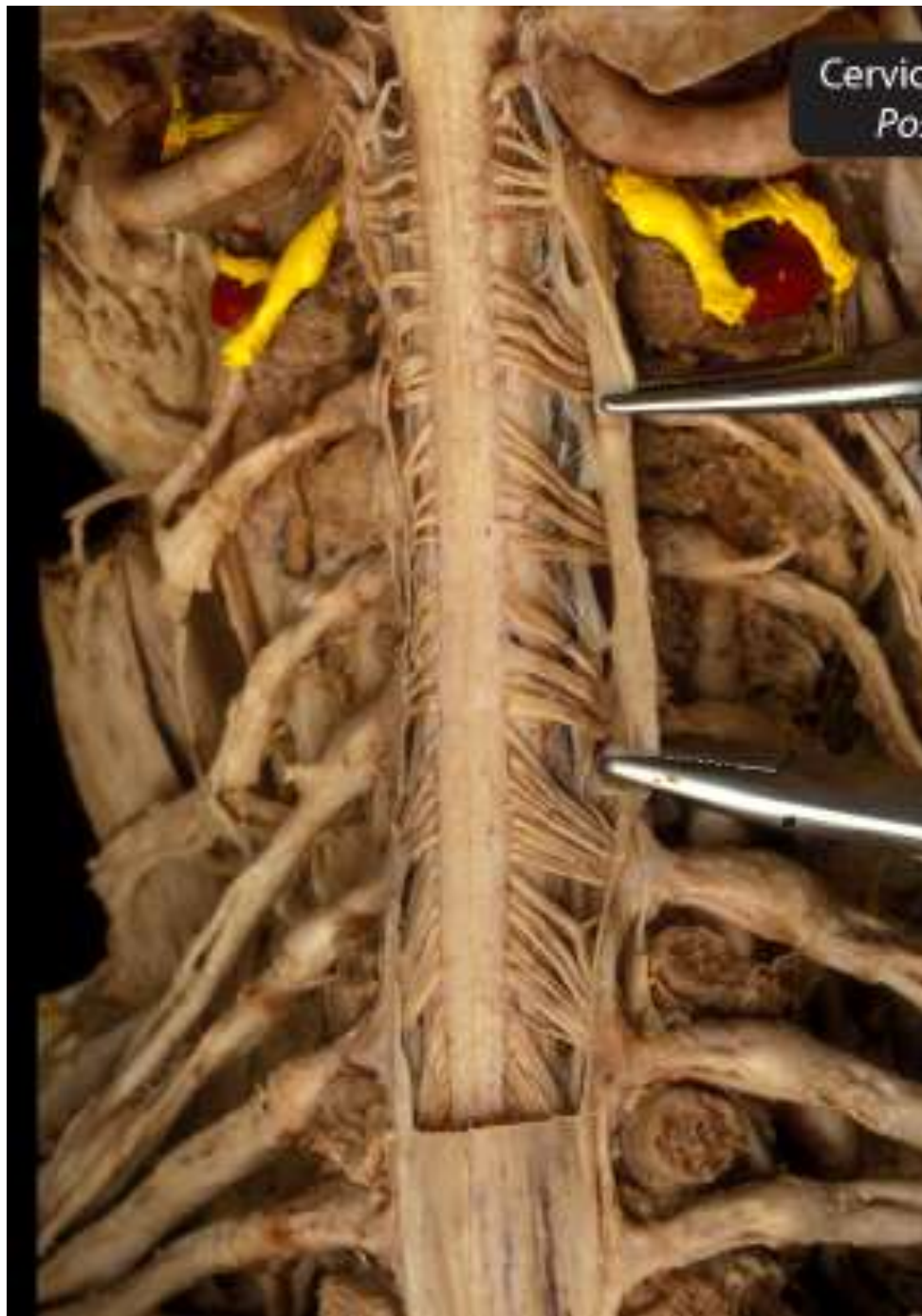


Course of Spinal Nerve Roots

- Upper cervical spinal nerve roots pass almost horizontally.
- Lower cervical and thoracic spinal nerve roots pass obliquely.
- Lumbar and sacral spinal nerve roots descend almost vertically downwards.

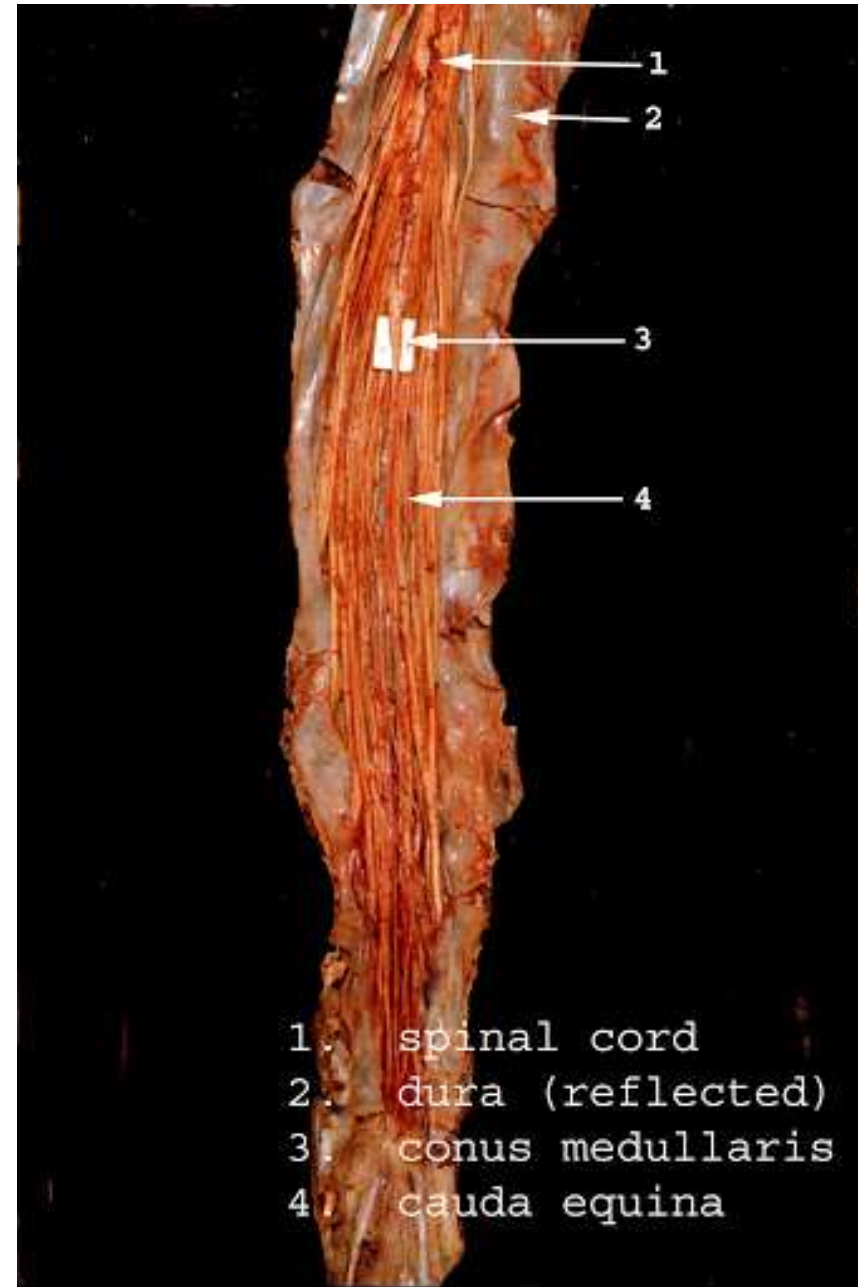
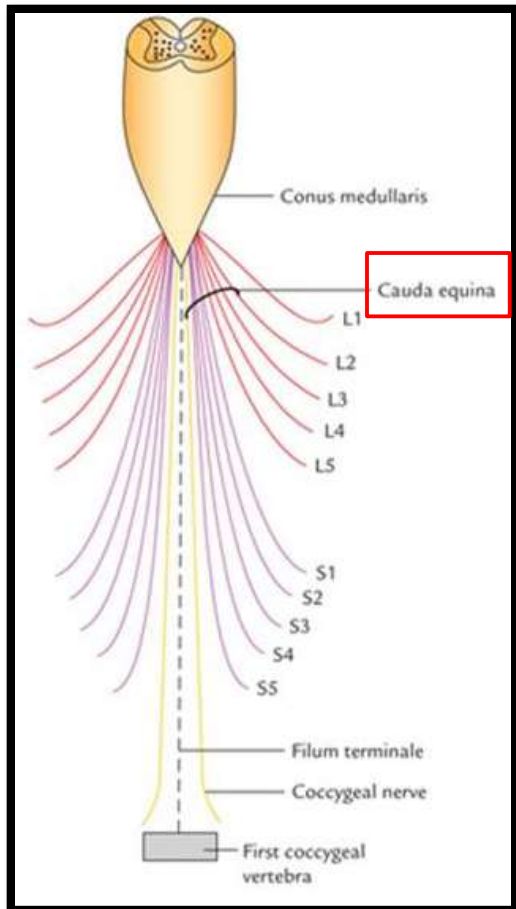


Cervical Spinal Cord
Posterior view



Cauda Equina

- Cauda= tail, Equina= horse
- It is a leash of lumbar (except L1), sacral and coccygeal nerve roots around the filum terminale.



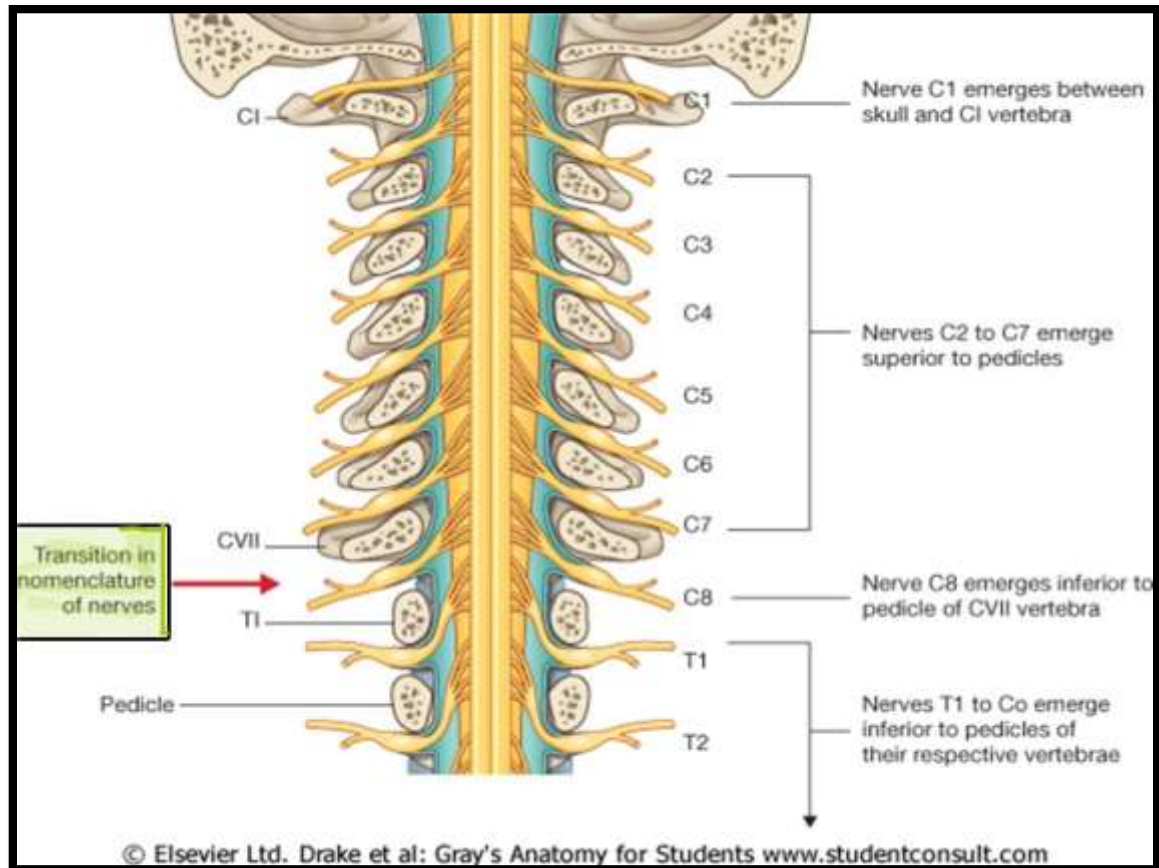
Exit of Spinal Nerves

In Cervical Region-

- C1 emerges above the posterior arch of atlas vertebra.
- C2 emerges between the posterior arch of atlas and axis vertebra.

In Thoracic region-

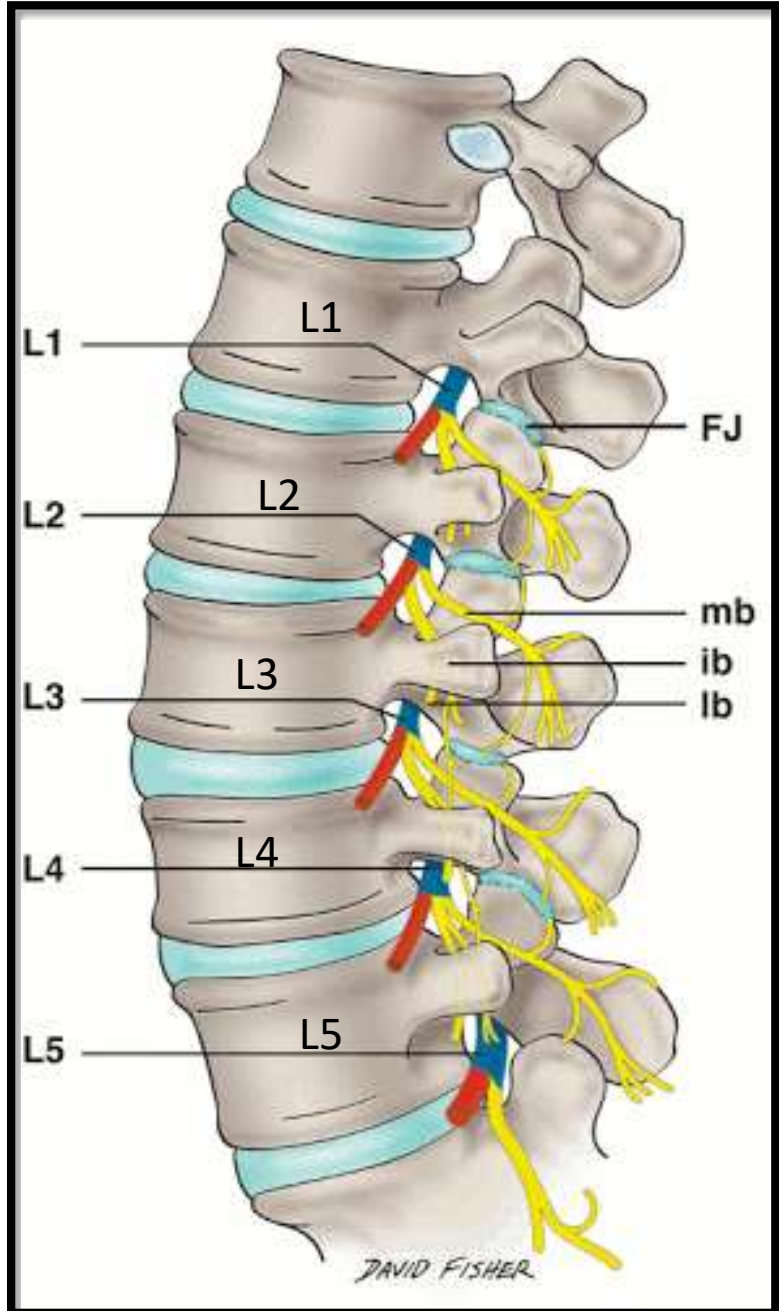
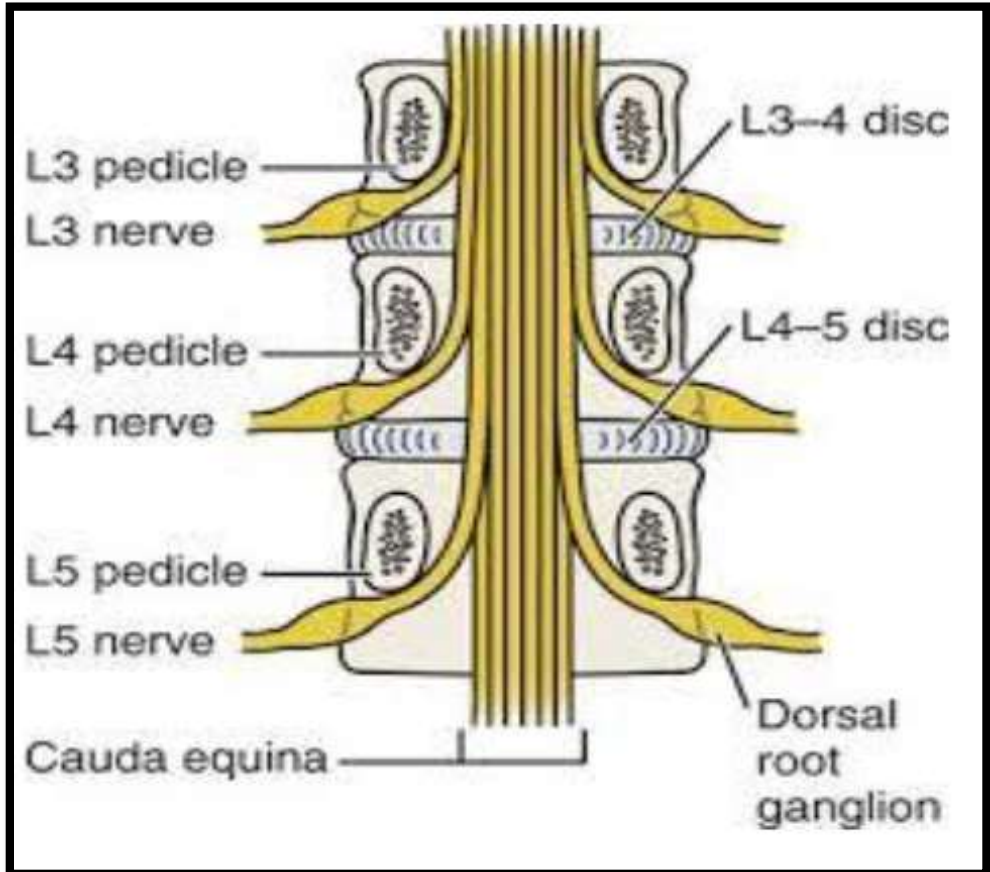
- All spinal nerves emerge through intervertebral foramina.



Exit of Spinal Nerves contd...

In Lumbar Region-

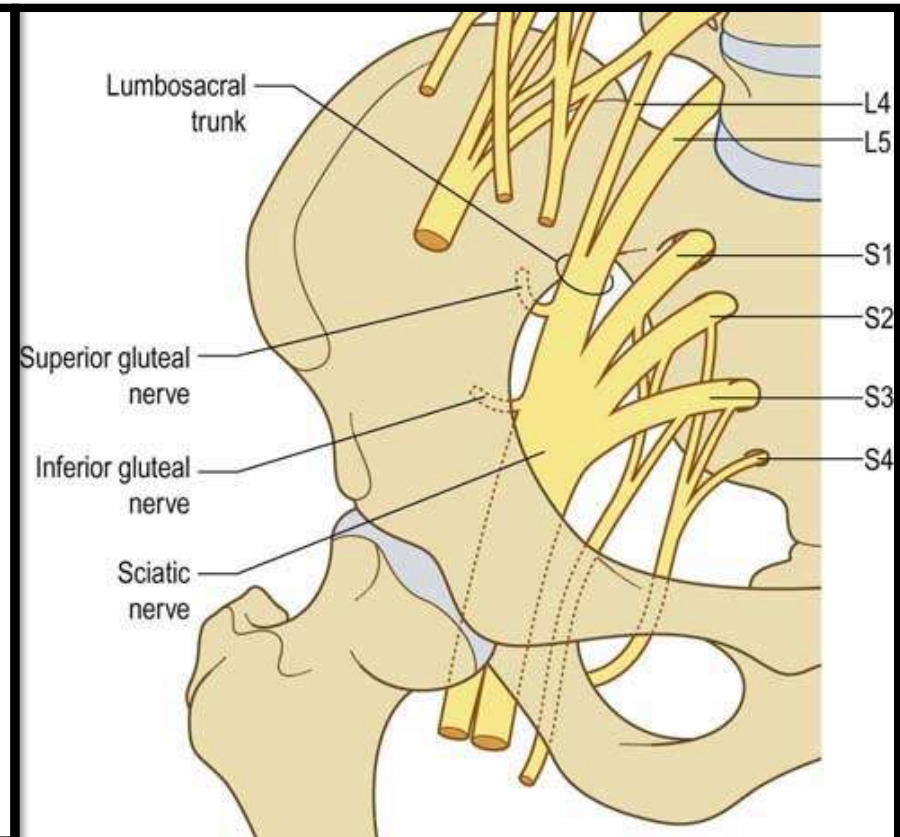
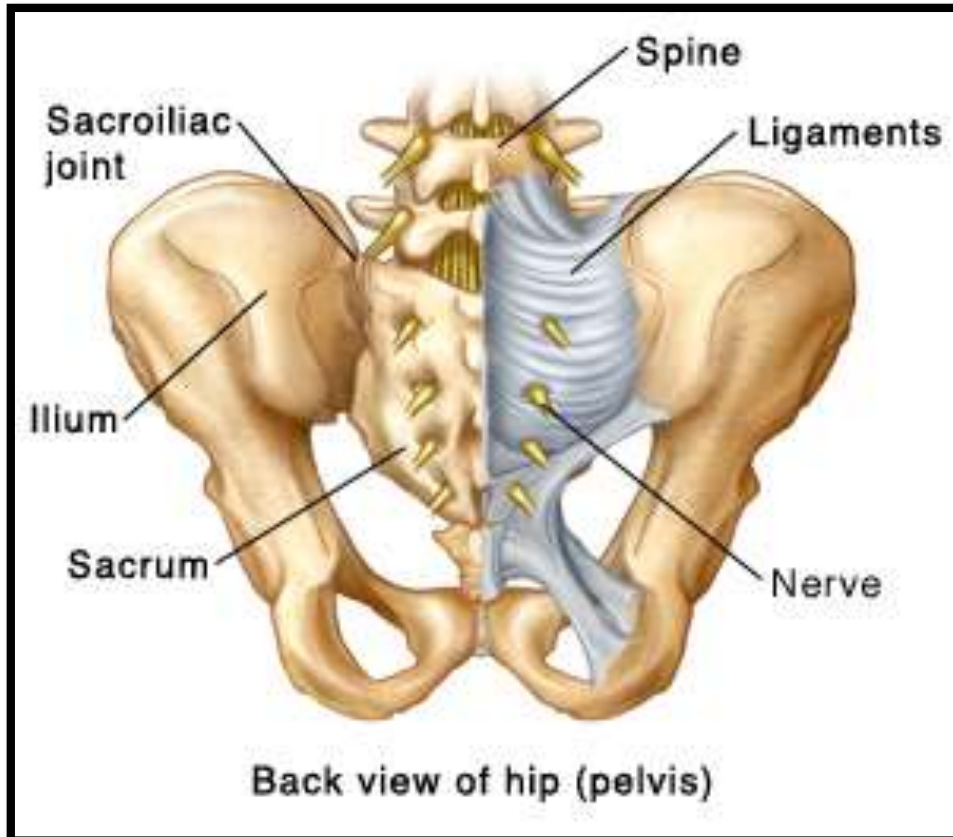
- All spinal nerves emerge through intervertebral foramina.

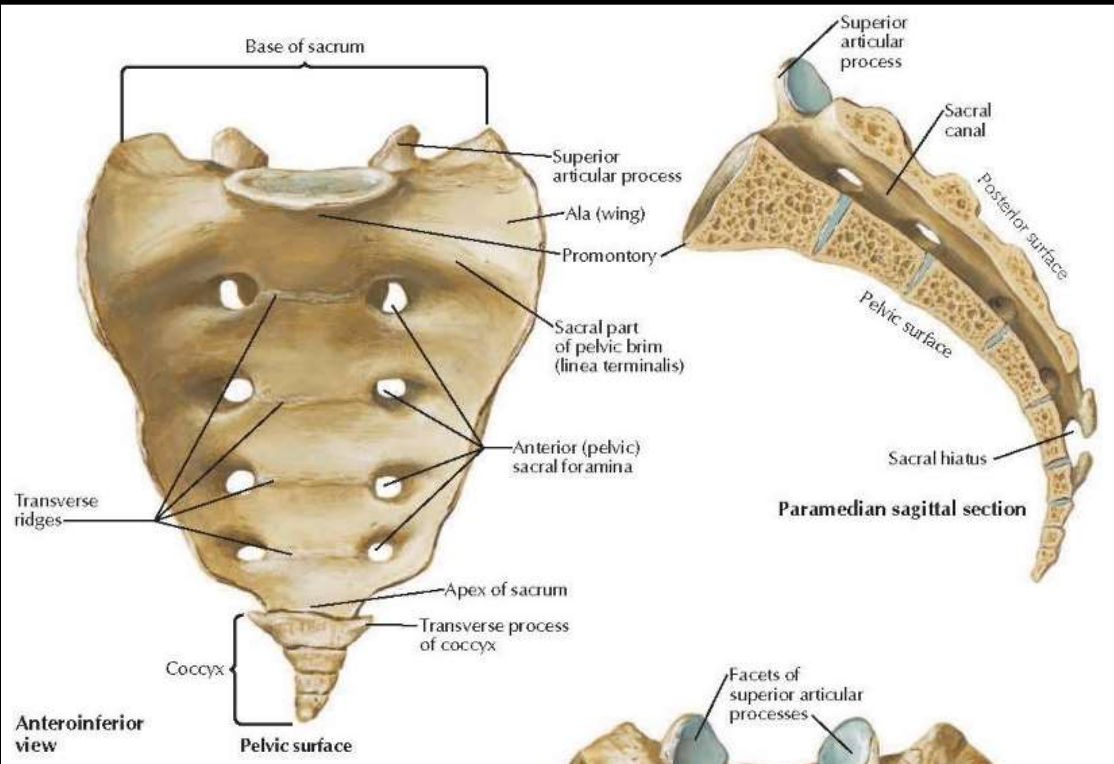


Exit of Spinal Nerves contd...

In Sacral Region- (except S5)

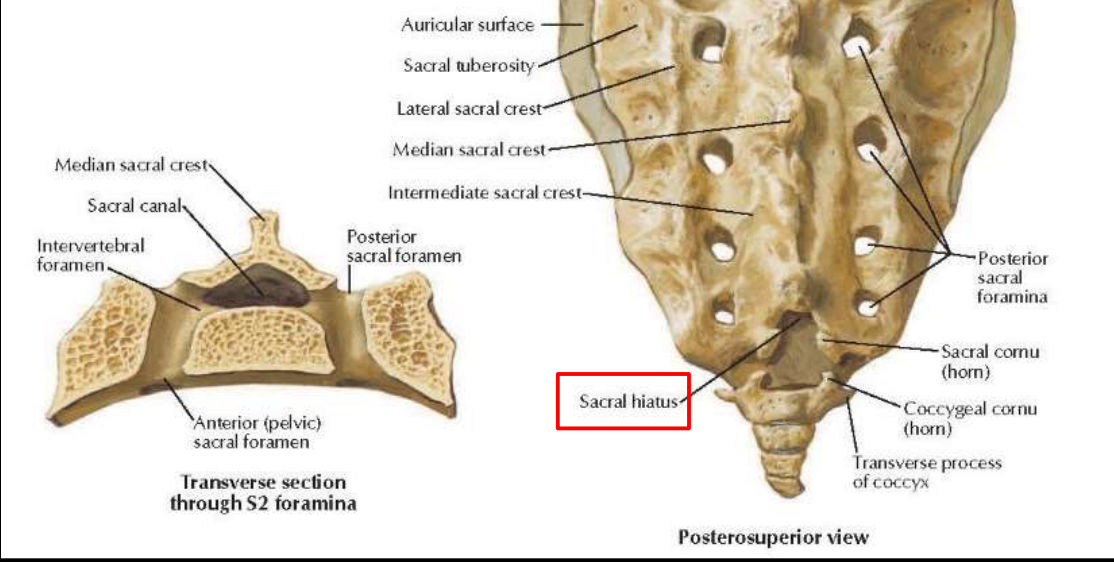
- Ventral rami emerge through ventral sacral foramina.
- Dorsal rami emerge through dorsal sacral foramina.
- S5 and Coccygeal 1 Spinal nerves emerge through sacral hiatus.





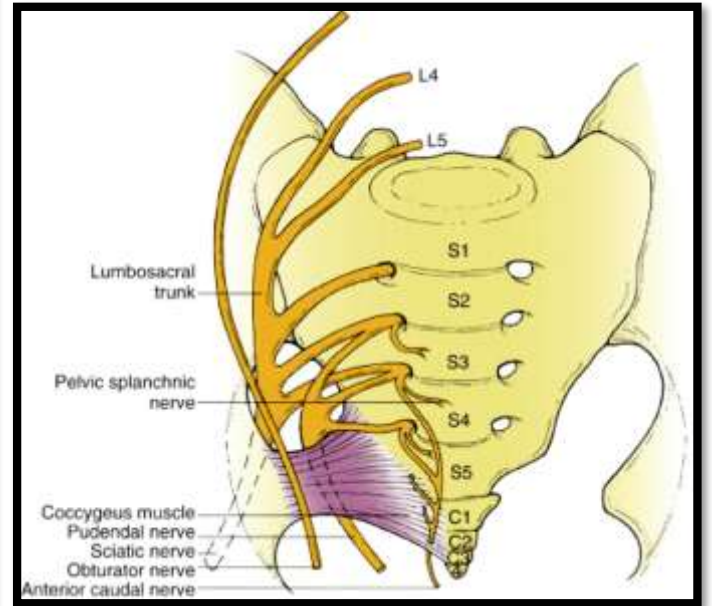
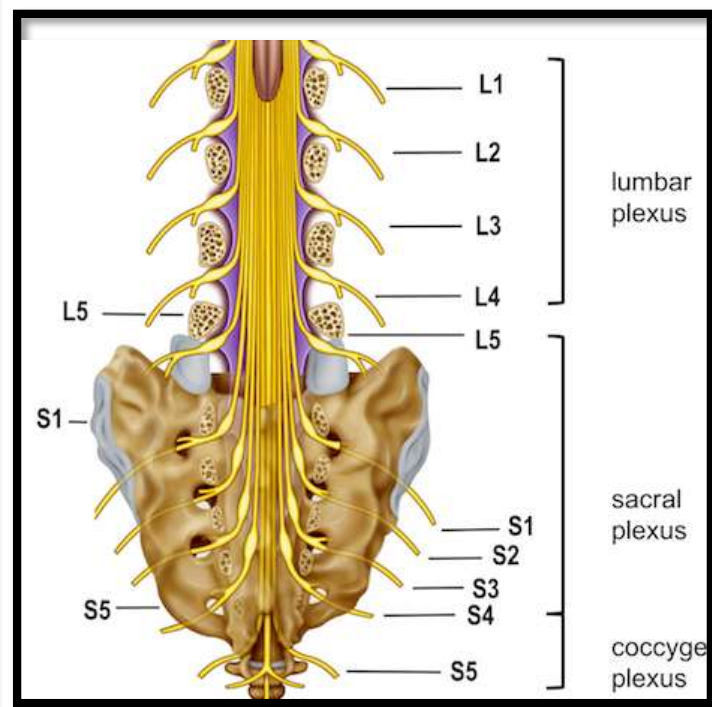
Anterior view

Paramedian sagittal section



Posterosuperior view

Transverse section through S2 foramina



Anterior view

Spinal Ganglia (Dorsal Root Ganglia)

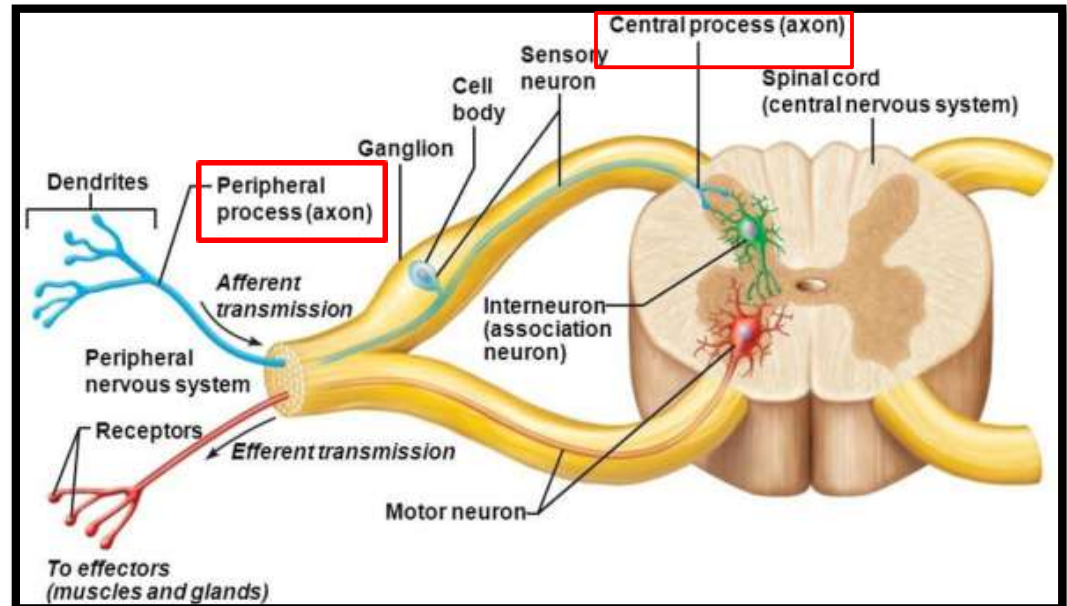
- ❖ These are collection of nerve cell bodies of pseudounipolar neurons in the dorsal roots of spinal nerves.
- ❖ The nerve cell body of pseudounipolar neuron gives rise to 2 processes:
 - Peripheral process.
 - Central process.

Peripheral Process-

- It is present in trunk of spinal nerve, rami of spinal nerve and peripheral nerves.

Central Process-

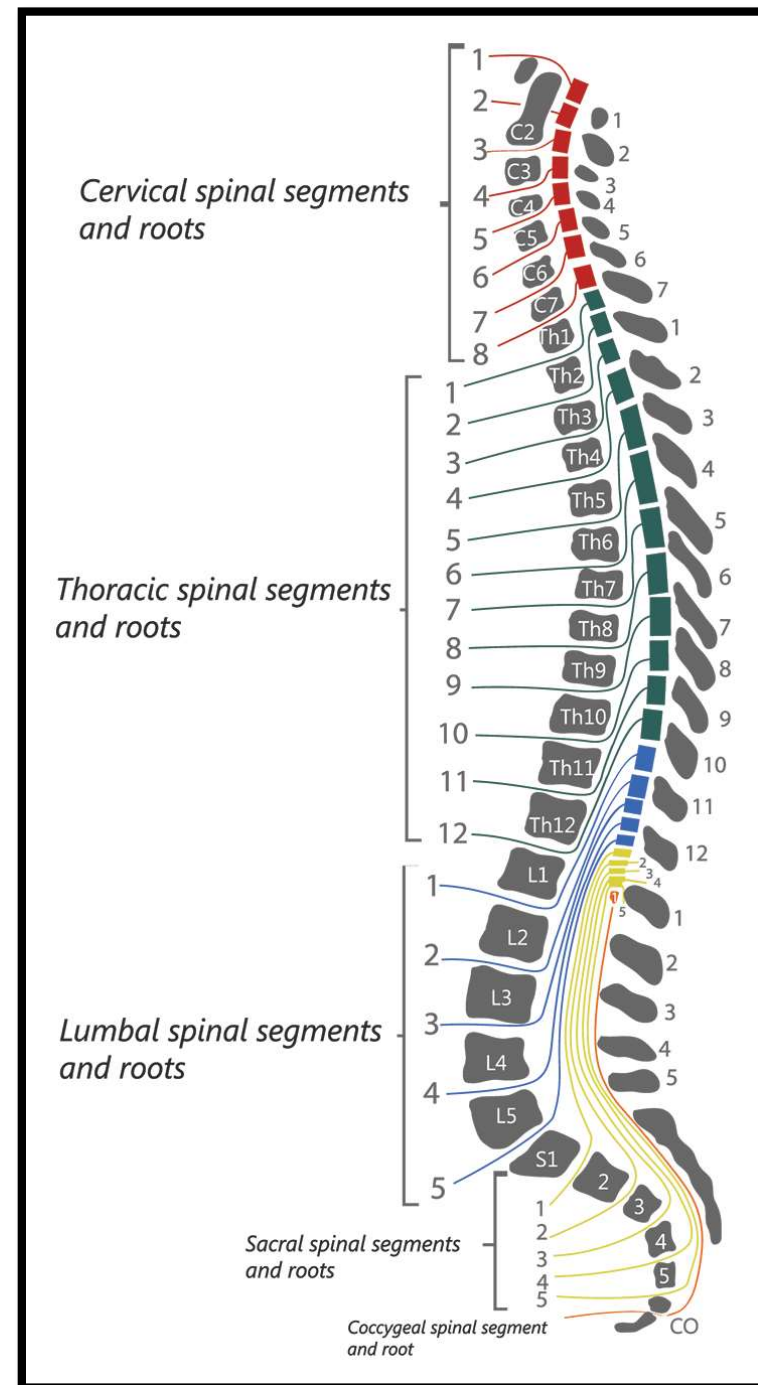
- It is present in dorsal root of spinal nerve.

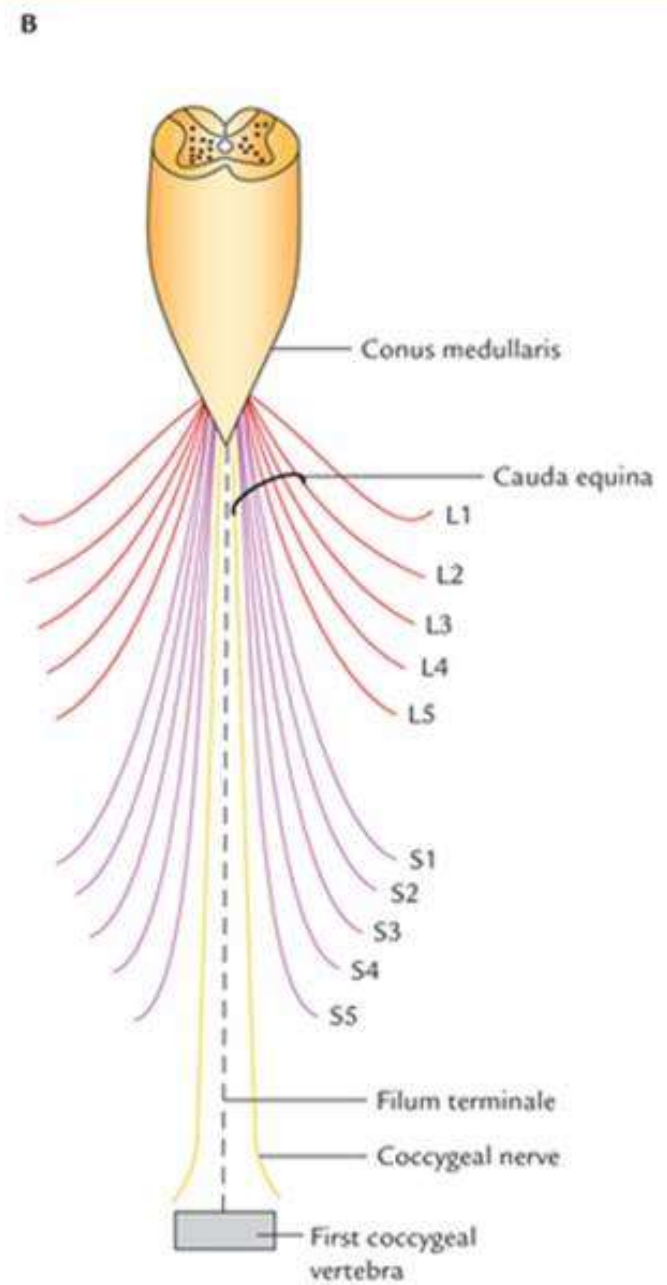
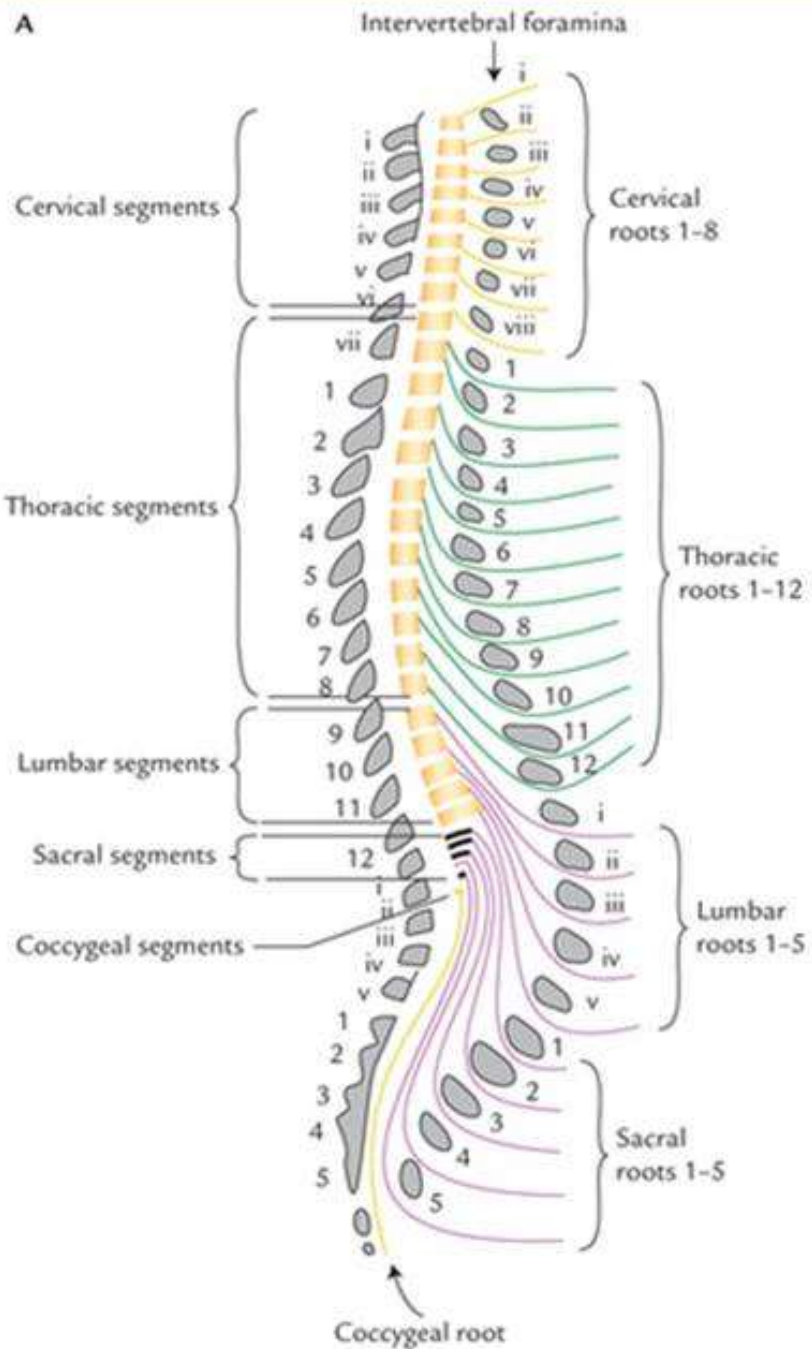


Spinal Segment

- The portion of spinal cord which gives origin to a pair of spinal nerves.
- There are 31 spinal segments.
- Spinal segments lie above their corresponding vertebral level.

Spinal Segments	Approximate Vertebral Level
Cervical 1-8	Foramen Magnum to C6 vertebra
Thoracic 1-6	C6-T4 vertebrae
Thoracic 7-12	T4-T9 vertebrae
Lumbar and Sacral	T 10 to L1 vertebrae



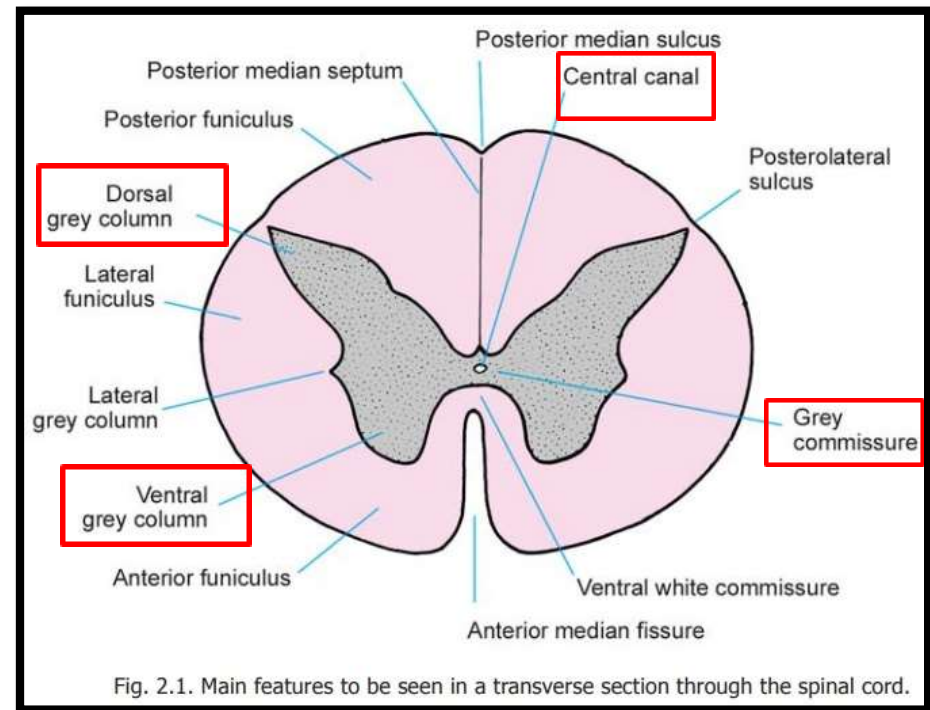


Internal Structure

- ❖ Spinal cord consists of:
 - Central grey matter.
 - Peripheral white matter.

Grey Matter-

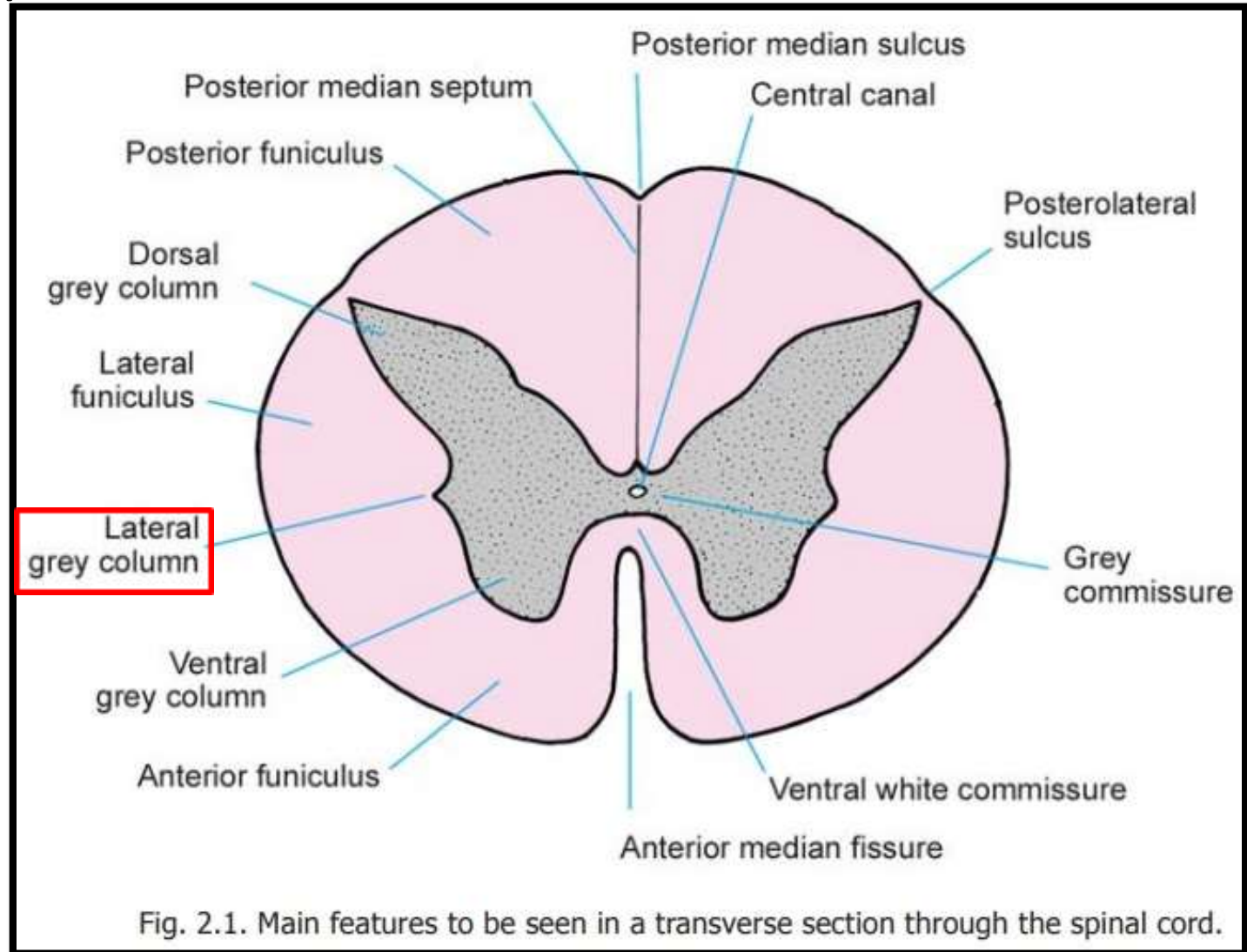
- ❖ In the cross section, it is seen as 'H' shaped or 'butterfly' shaped.
- ❖ Grey matter of right and left half of spinal cord is connected across the midline by a **transverse grey commissure**.
- ❖ Central canal of spinal cord passes through the center of grey commissure.
- ❖ In each half of spinal cord, grey matter is divided into:
 - **Narrow elongated posterior horn.**
 - **Broad anterior horn.**
- ❖ **Posterior horn** reaches almost up to the surface of spinal cord.
- ❖ **Anterior horn** does not reach up to the surface of spinal cord.



Internal Structure contd...

❖ Following segments of spinal cord also have lateral horn of grey matter:

- T1 to L2
- S2,3 &4



White Matter

❖ In each half of spinal cord, it is divided into 3 parts:

- Anterior White Column.
- Lateral White Column.
- Posterior White Column.

Anterior White Column-

- Between the anterior median fissure and anterior horn of grey matter.

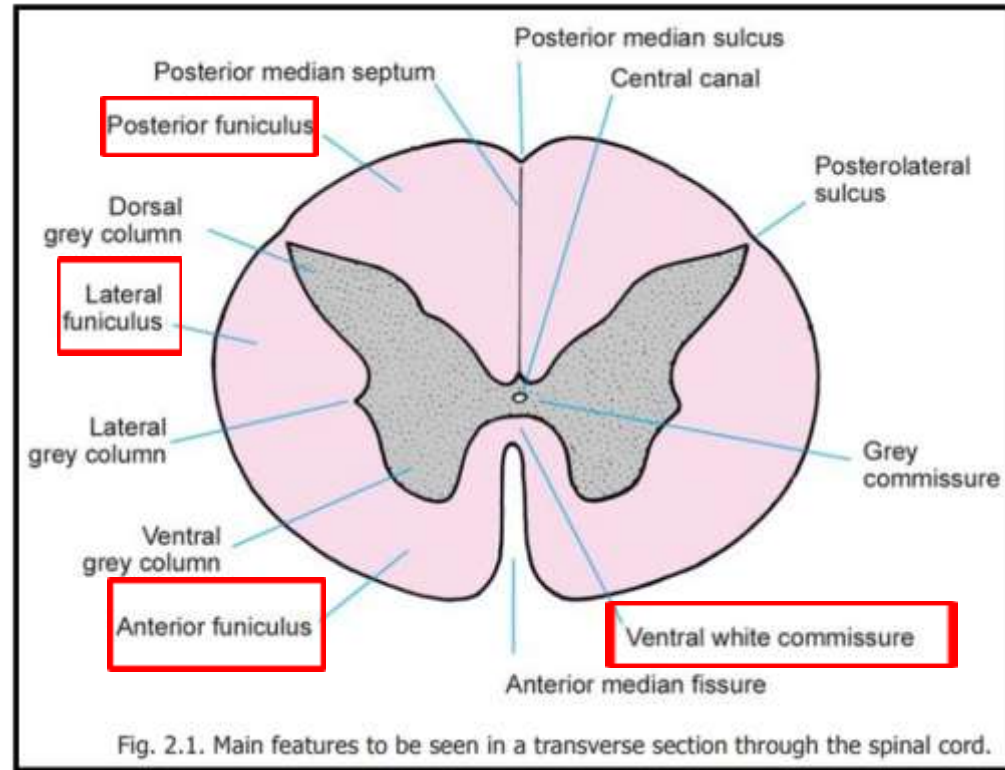
Lateral White Column-

- Between the anterior and posterior grey horns.

Posterior White Column-

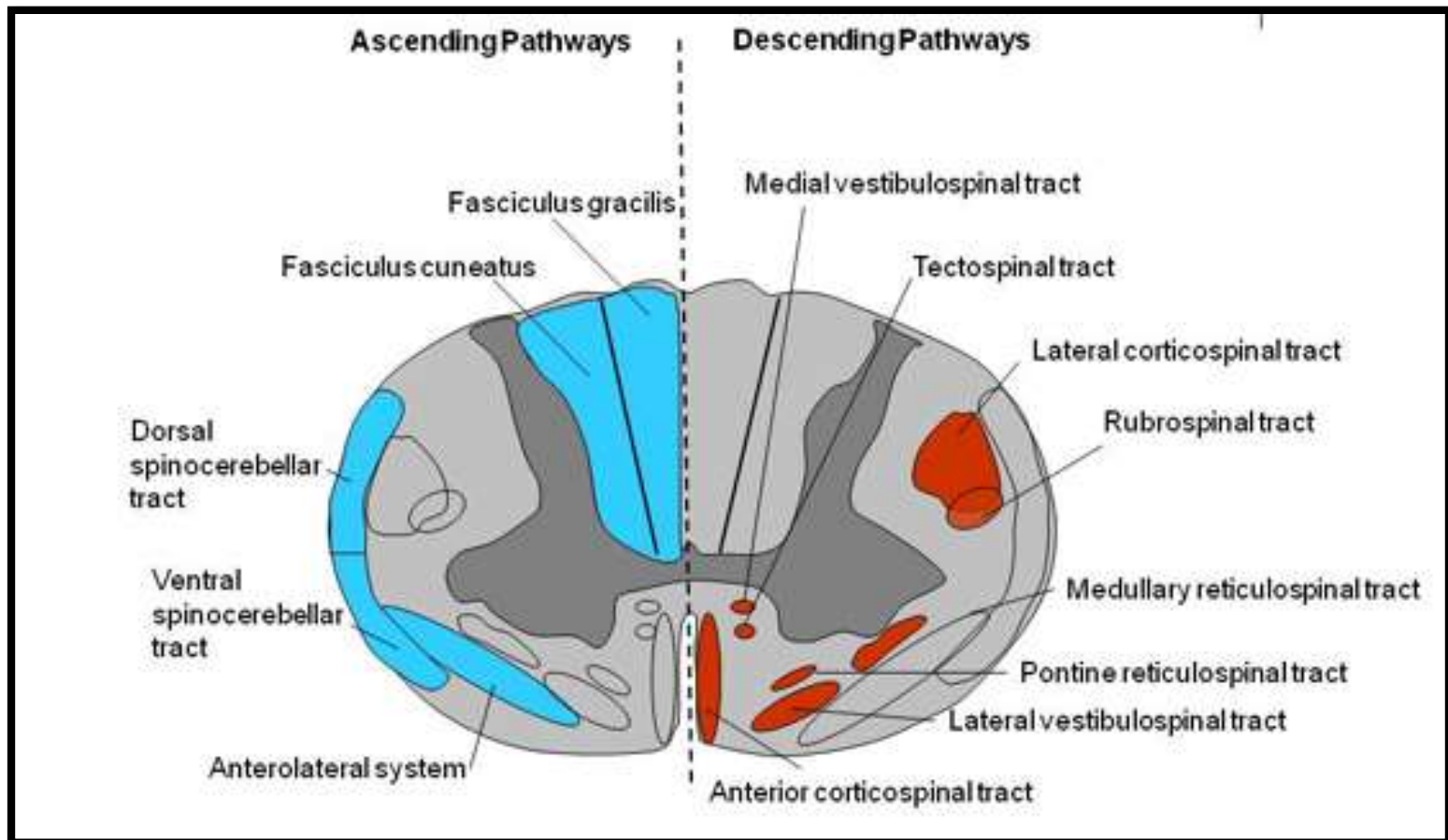
- Between the posterior grey horn and posterior median septum.

❖ Anterior white columns of both side are joined by the anterior white commissure.



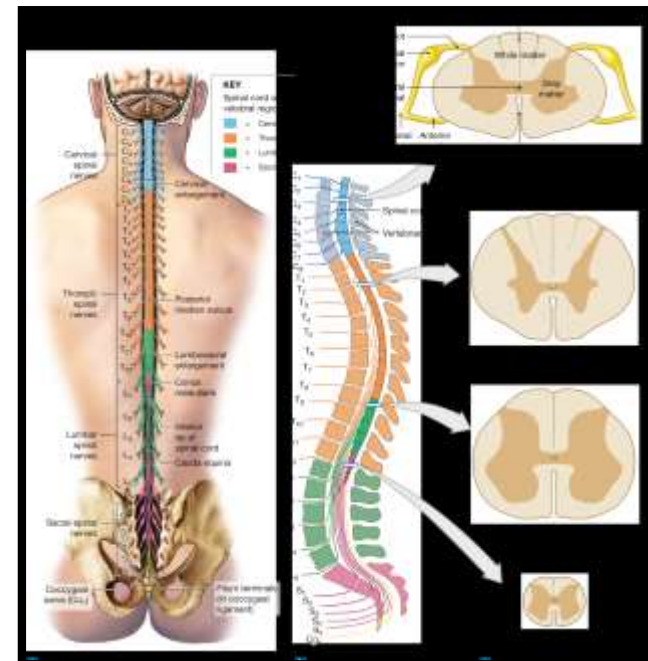
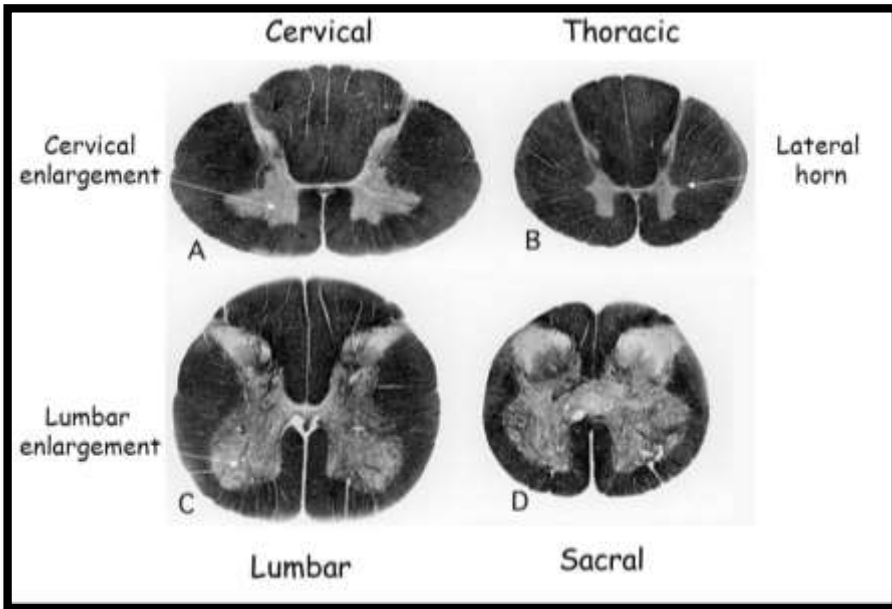
White Matter contd...

- ❖ Each white column consists of tracts.
- ❖ Posterior white column consists of **ascending (sensory)** tracts.
- ❖ Anterior white column consists of **descending (motor)** tracts.
- ❖ Lateral white column consists of mixed tracts.



Comparison of Spinal Segments

Characteristic features of spinal segments	Regions		
	Cervical	Thoracic	Lumbar
Grey matter	Large	Small	Large
Posterior horn	Slender	Slender	Bulbous
Anterior horn	Massive	Slender	Bulbous
Lateral horn	Absent	Present	Present only in L1 & L2 segments
Reticular Formation	Well developed	Poorly developed	Absent
White matter	Massive	Large but less than in the cervical region	Less

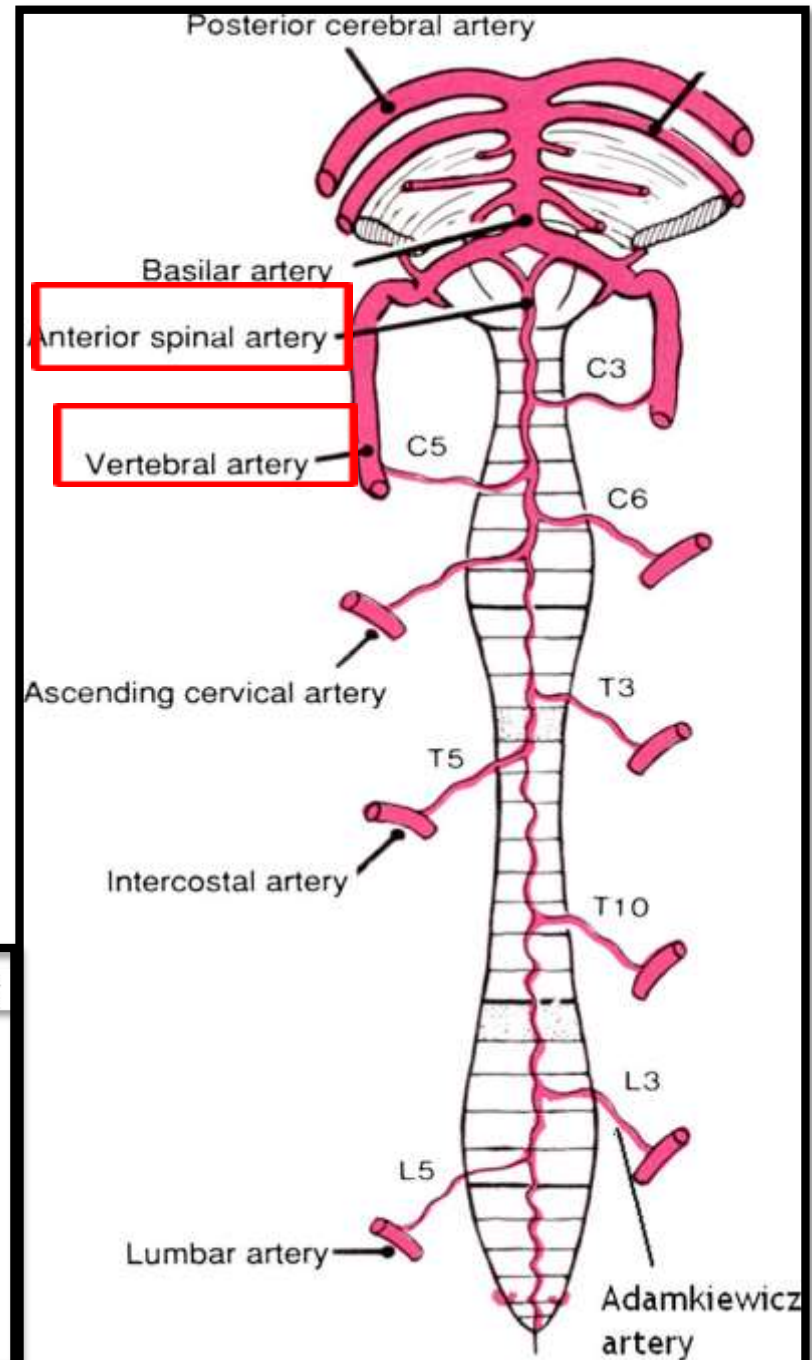
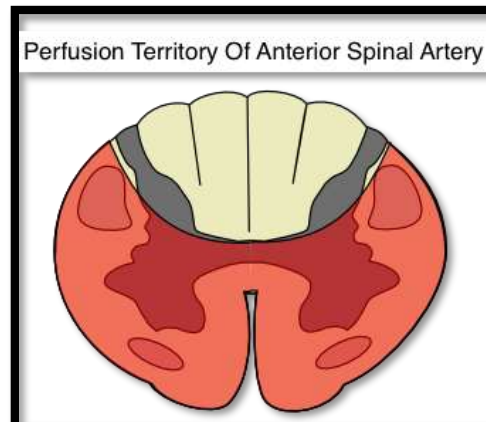


Arterial Supply

- ❖ Spinal cord is supplied by:
 - Anterior Spinal Artery.
 - Posterior Spinal Arteries.
 - Segmental Arteries.

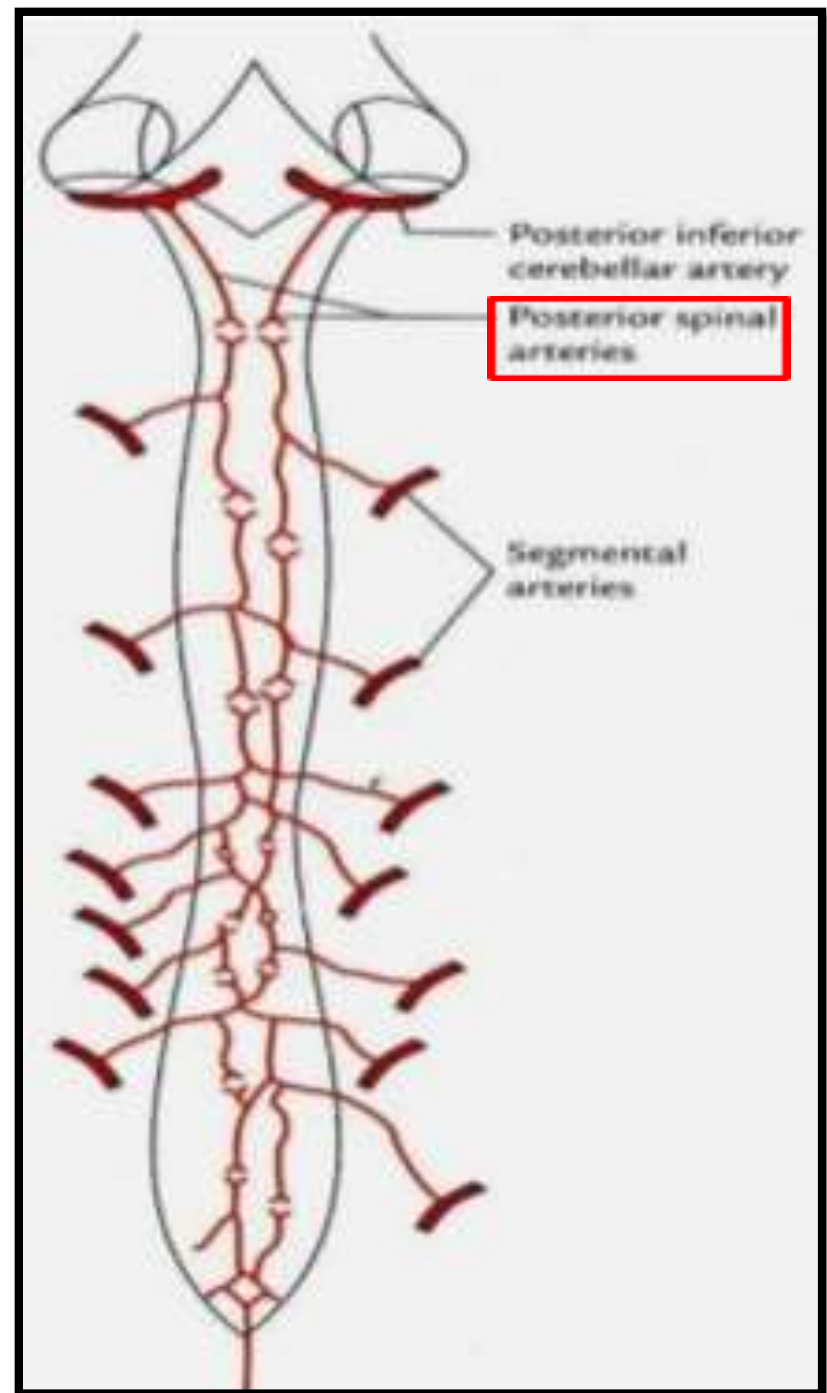
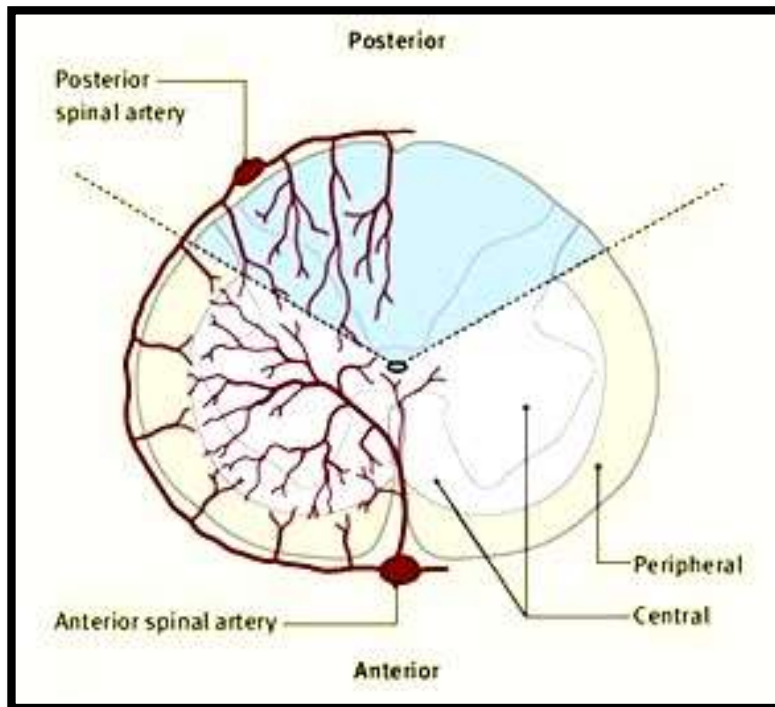
Anterior Spinal Artery-

- It is formed by union of two spinal arteries.
- Each spinal artery arises from **Vertebral Artery**.
- Anterior spinal artery runs in the **anterior median fissure** of spinal cord.
- Anterior spinal artery supplies the **anterior 2/3rd** of spinal cord.



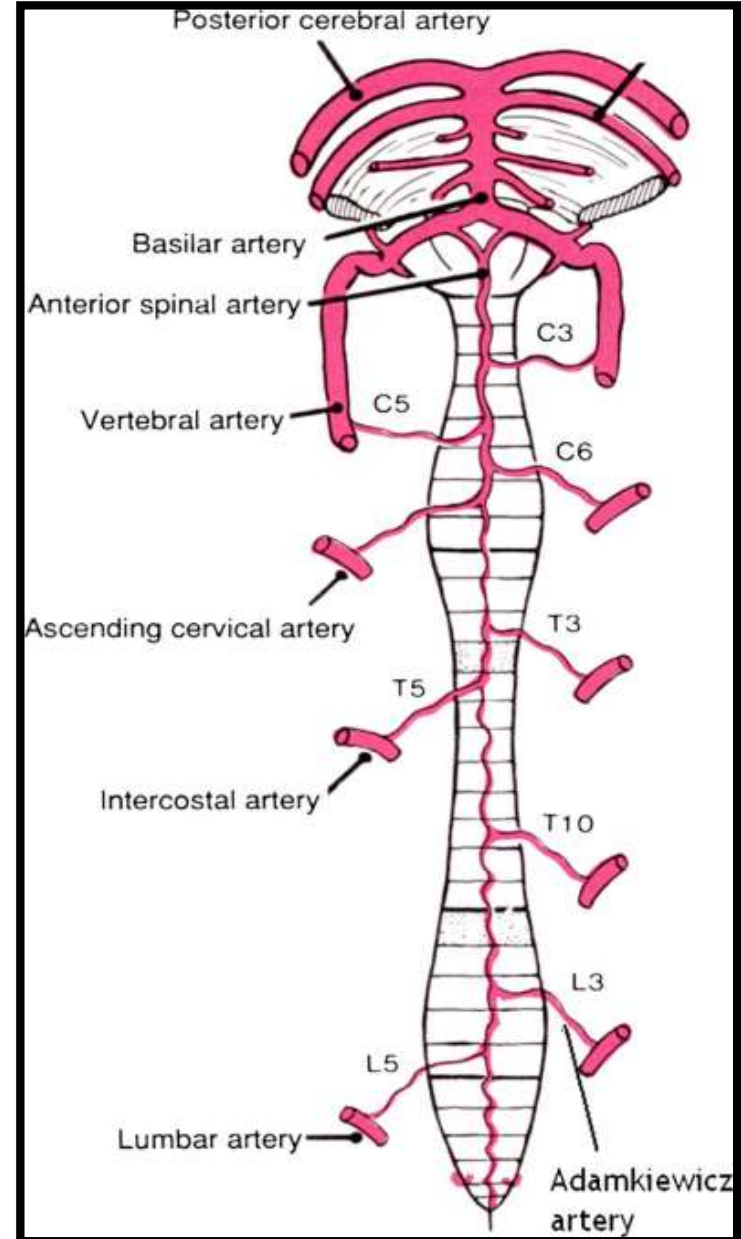
Posterior Spinal Arteries

- There are **two** posterior spinal arteries.
- Each posterior spinal artery arises from either the **vertebral artery** or the **posterior inferior cerebellar artery**.
- Each posterior spinal artery runs in the **posterolateral sulcus** of spinal cord.
- Posterior spinal arteries supply the **posterior 1/3rd** of spinal cord.



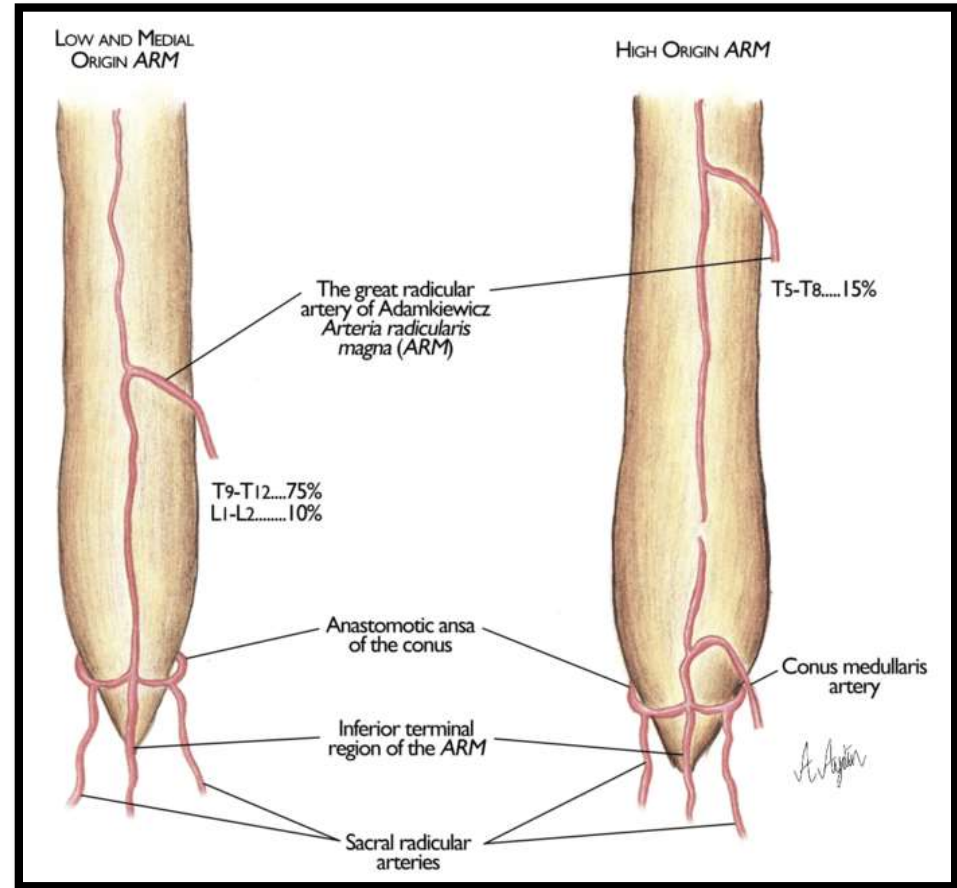
Segmental Arteries

- ❖ These arteries are branches of:
 - Deep cervical artery.
 - Ascending cervical artery.
 - Intercostal arteries.
 - Lumbar arteries.
- ❖ Segmental arteries reach the spinal cord as **anterior** and **posterior radicular arteries**.
- ❖ **Anterior radicular artery** runs along the anterior root of spinal nerve.
- ❖ **Posterior radicular artery** runs along the posterior root of spinal nerve.



Segmental Arteries contd...

- Anterior radicular arteries in the lower cervical, lower thoracic and upper lumbar regions are enlarged and known as **great radicular arteries**.
- Largest of the great radicular arteries is known as **Arteria Radicularis Magna (Artery of Adamkiewicz)**.
- **Arteria Radicularis Magna (ARM)** varies in position but usually arises in lower thoracic or upper lumbar region



thank
you
J