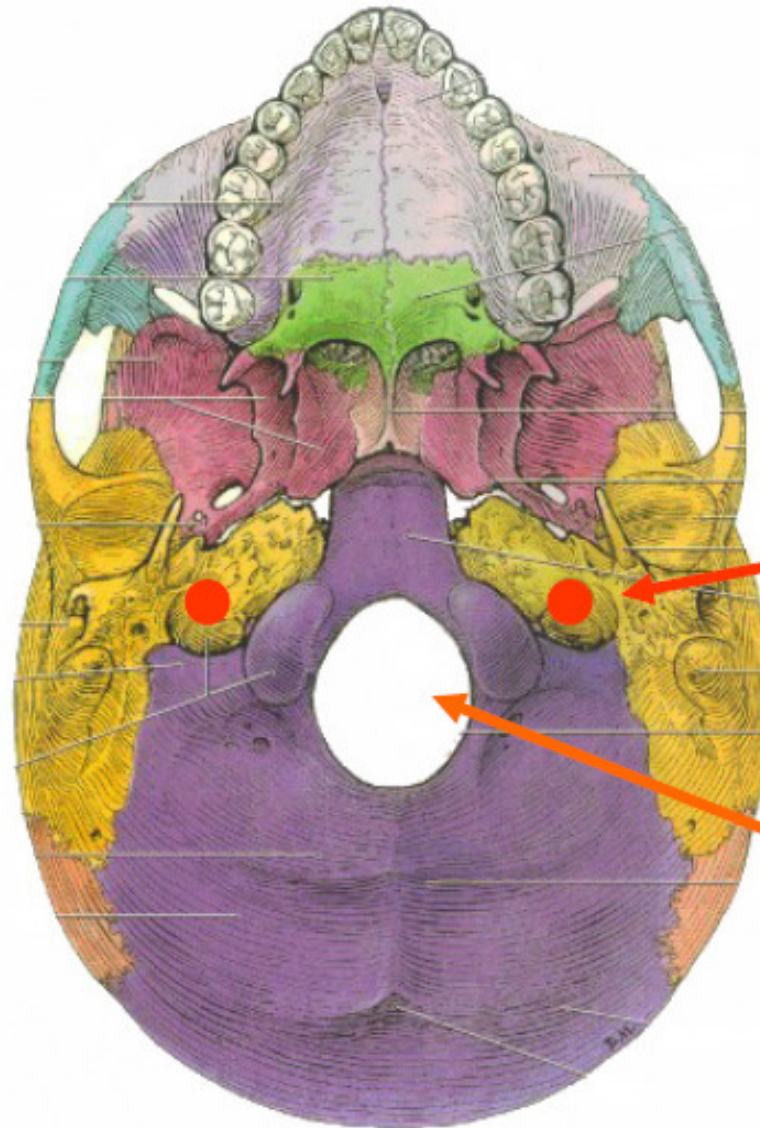


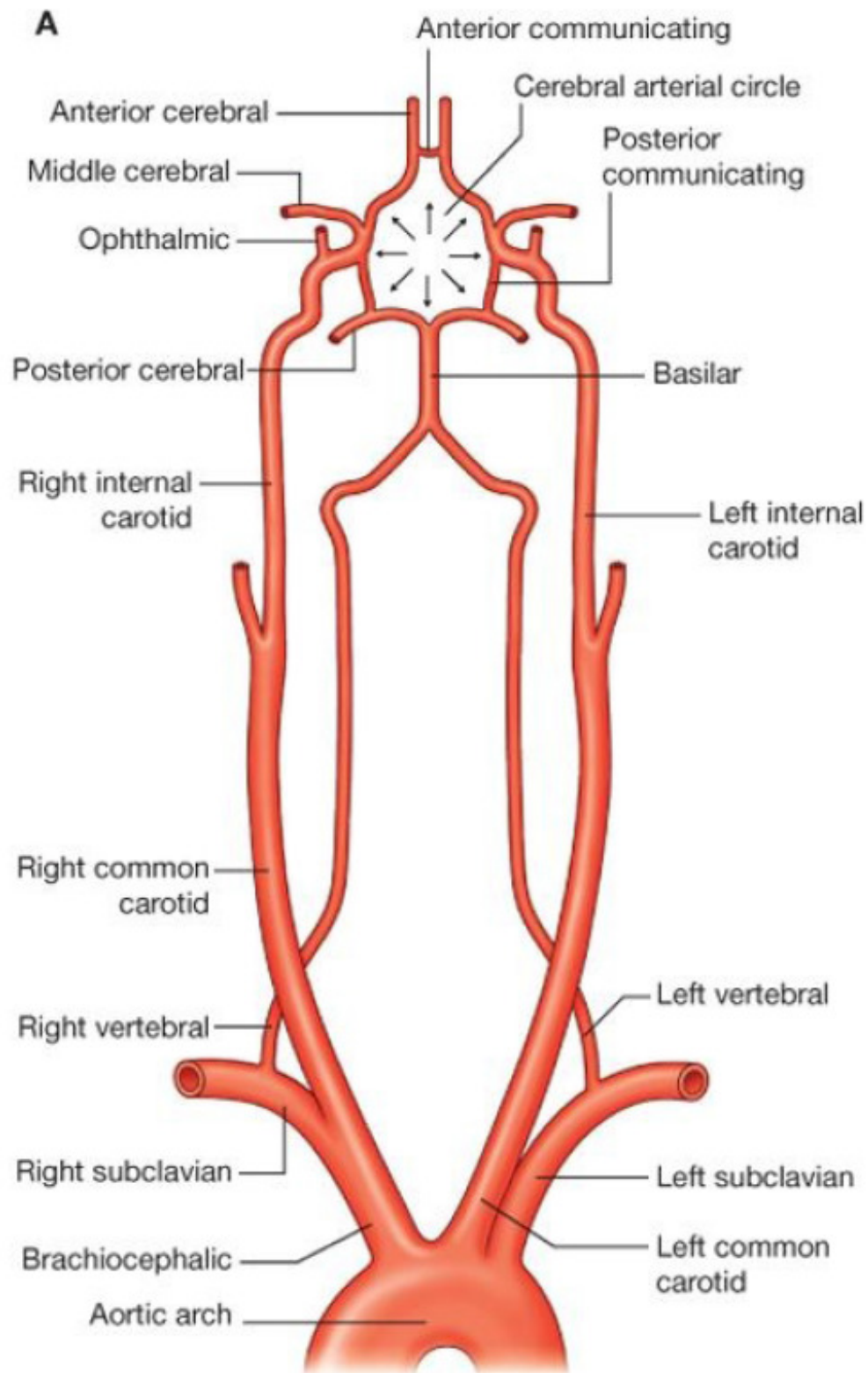
Arterial Blood Supply

- Brain is supplied by pairs of internal carotid artery and vertebral artery.
- The four arteries lie within the subarachnoid space
- Their branches anastomose on the inferior surface of the brain to form the **circle of Willis**

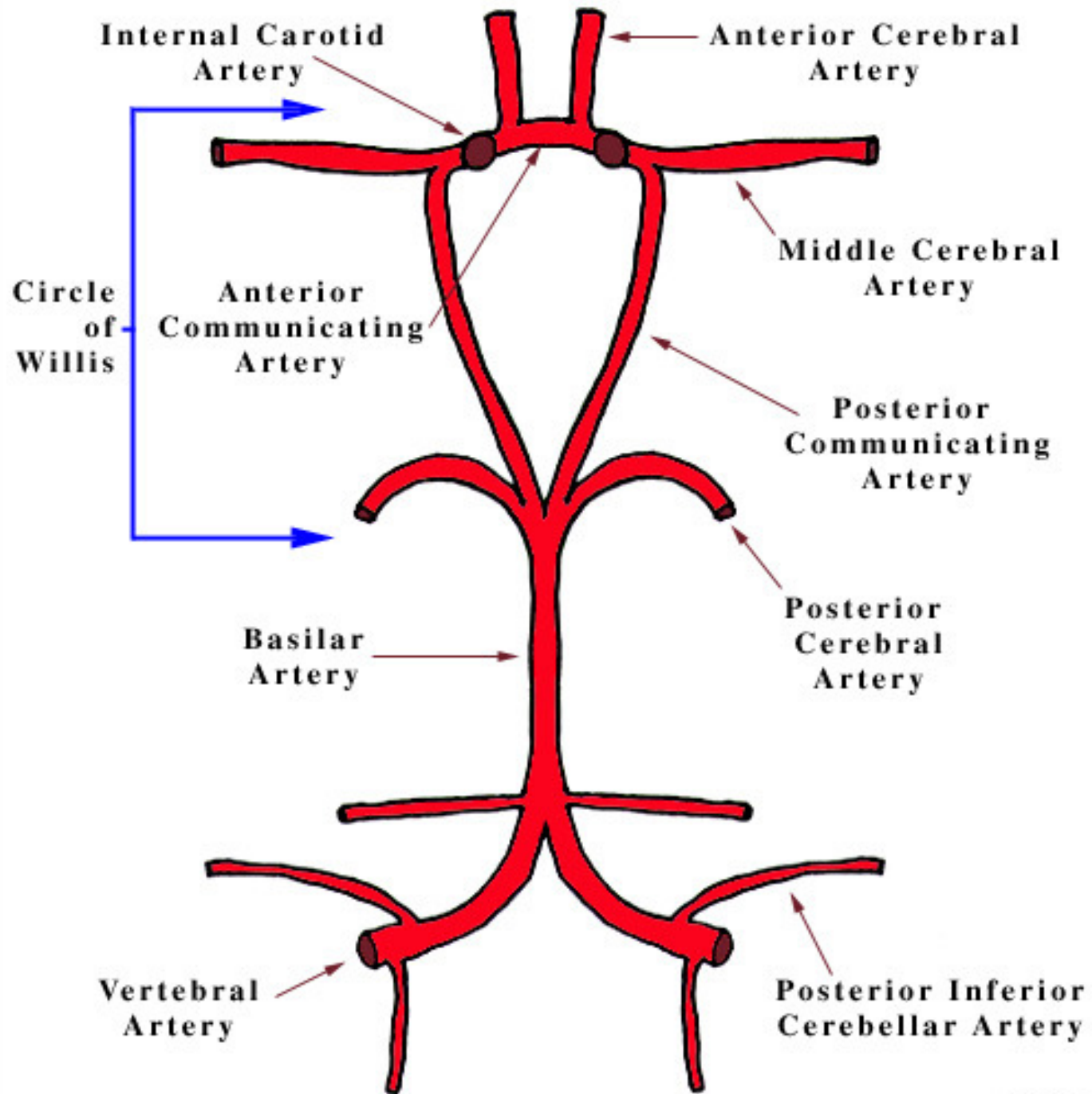


A. Internal Carotid Artery- enters skull via Carotid Canal And Foramen Lacerum

B. Vertebral artery- enters skull via Foramen Magnum



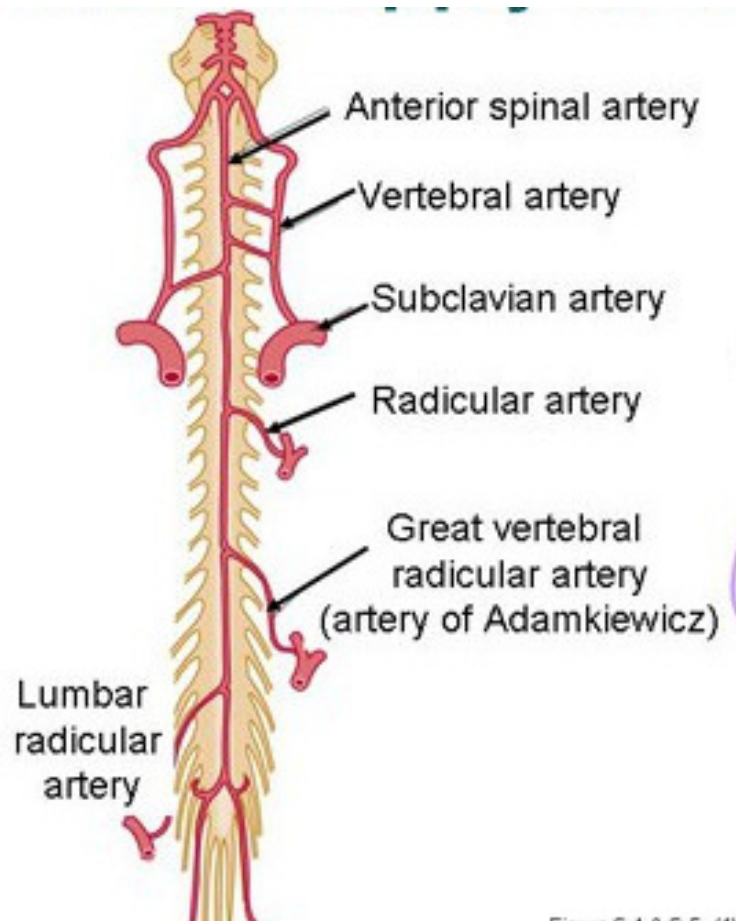
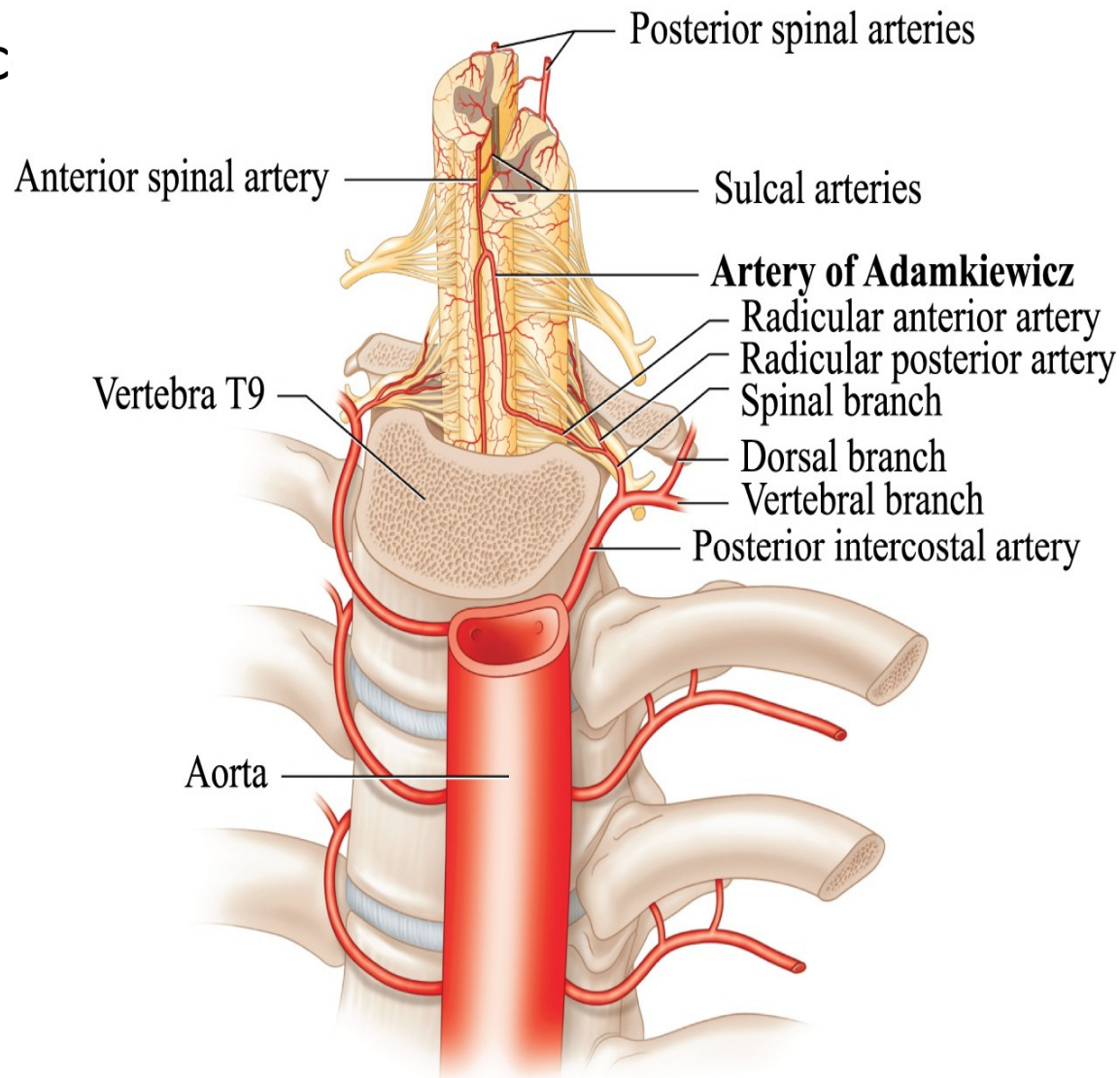
CIRCLE OF WILLIS



Blood supply of spinal c

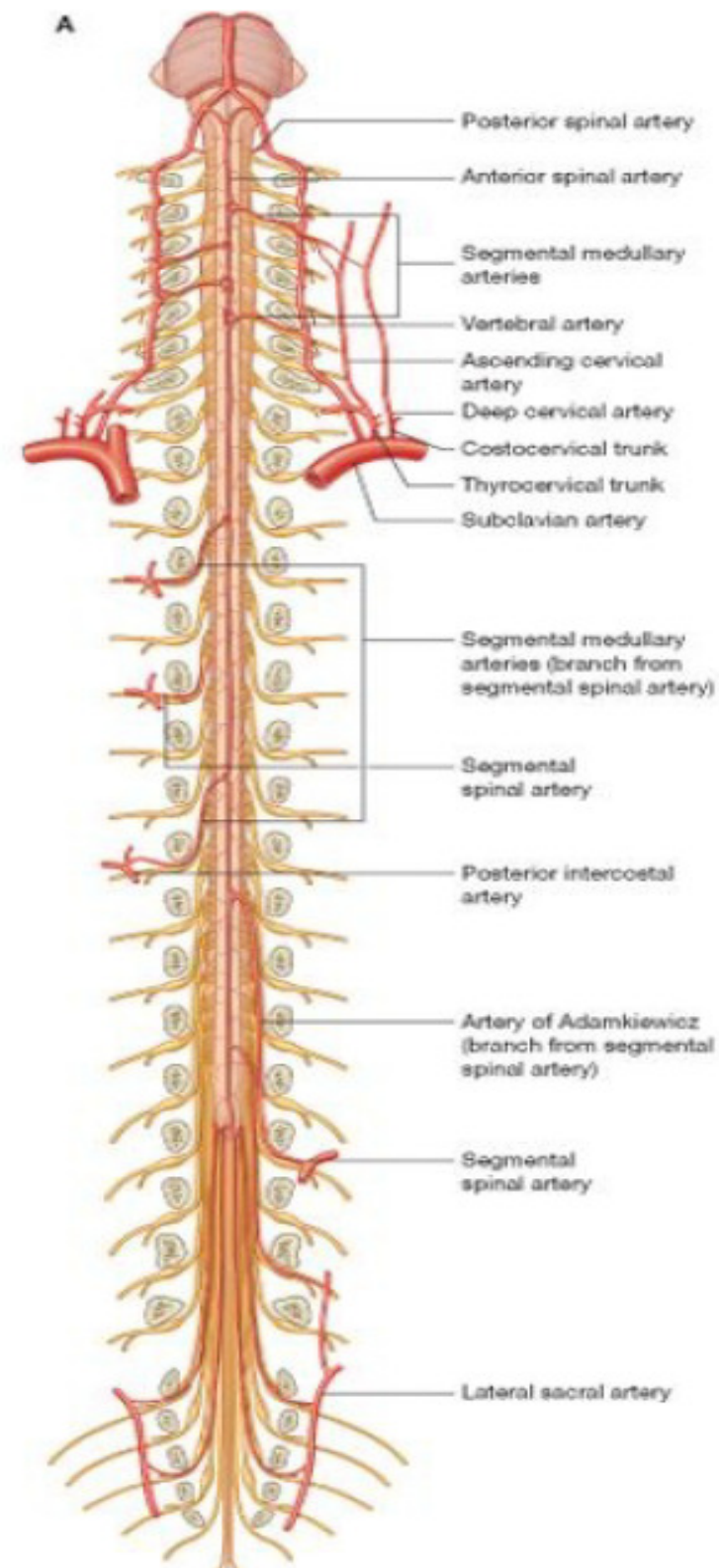
- **Longitudinal arteries:**

- **One anterior spinal artery:** arise from the vertebral arteries (in anterior median fissure)
- **Two posterior spinal arteries:** arise from the posterior inferior cerebellar artery (in the posterolateral sulcus)



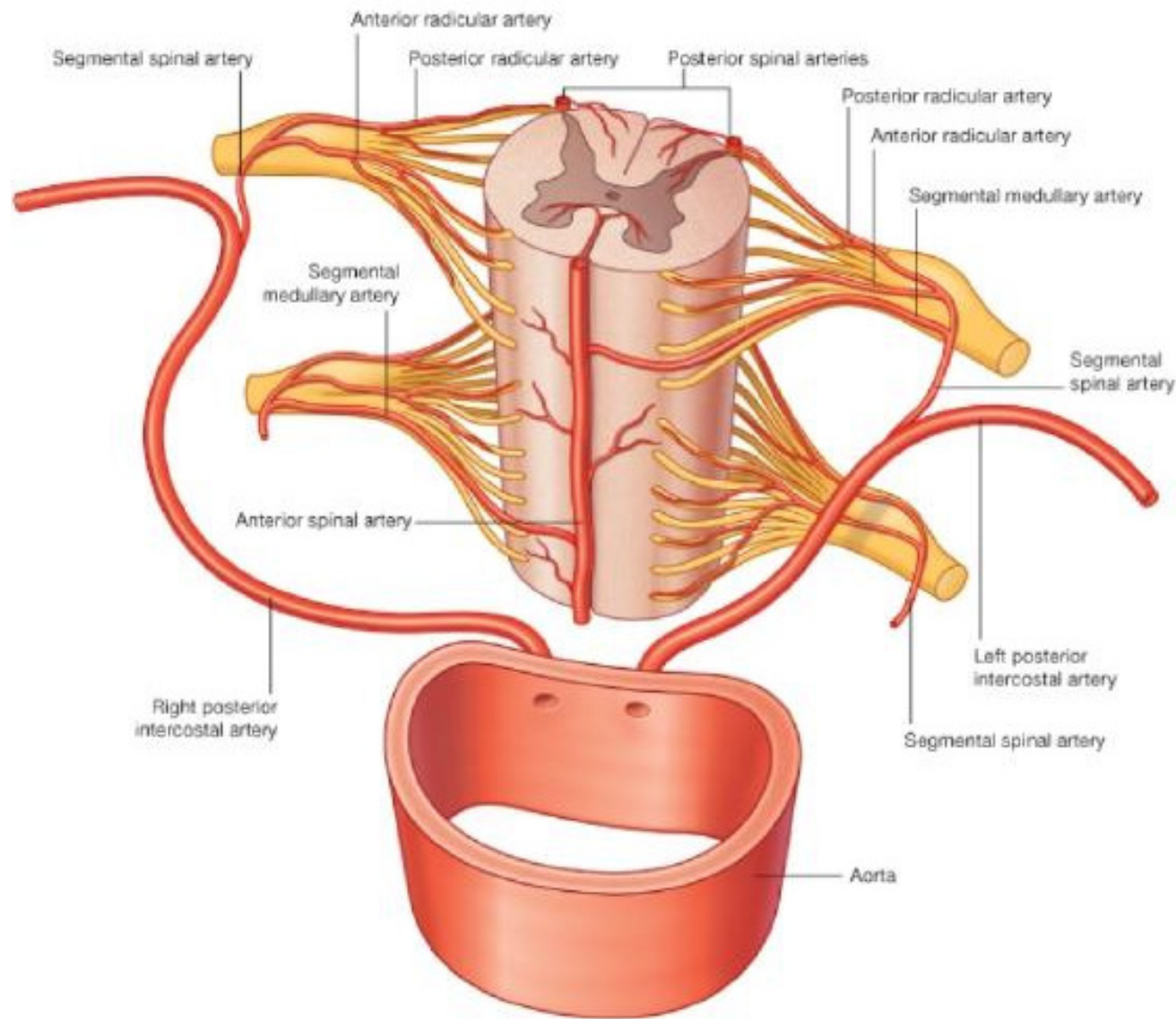
Blood supply of spinal cord

- **segmental spinal arteries**, arise from:
 - Vertebral arteries
 - Deep cervical arteries in the neck
 - Posterior intercostal arteries in the thorax
 - lumbar arteries in the abdomen
- **Branches :**
 - **Anterior radicular arteries**
 - **Posterior radicular arteries**
 - **Segmental medullary arteries**
- **Artery of Adamkiewicz**
 - usually on the left side,
 - reinforces the arterial supply to the lower portion of the spinal cord
 - From Left posterior intercostal artery at the level of the 9th to 12th intercostal artery, which branches from the aorta, and supplies the lower two thirds of the spinal cord
 - Anastomose with anterior spinal artery



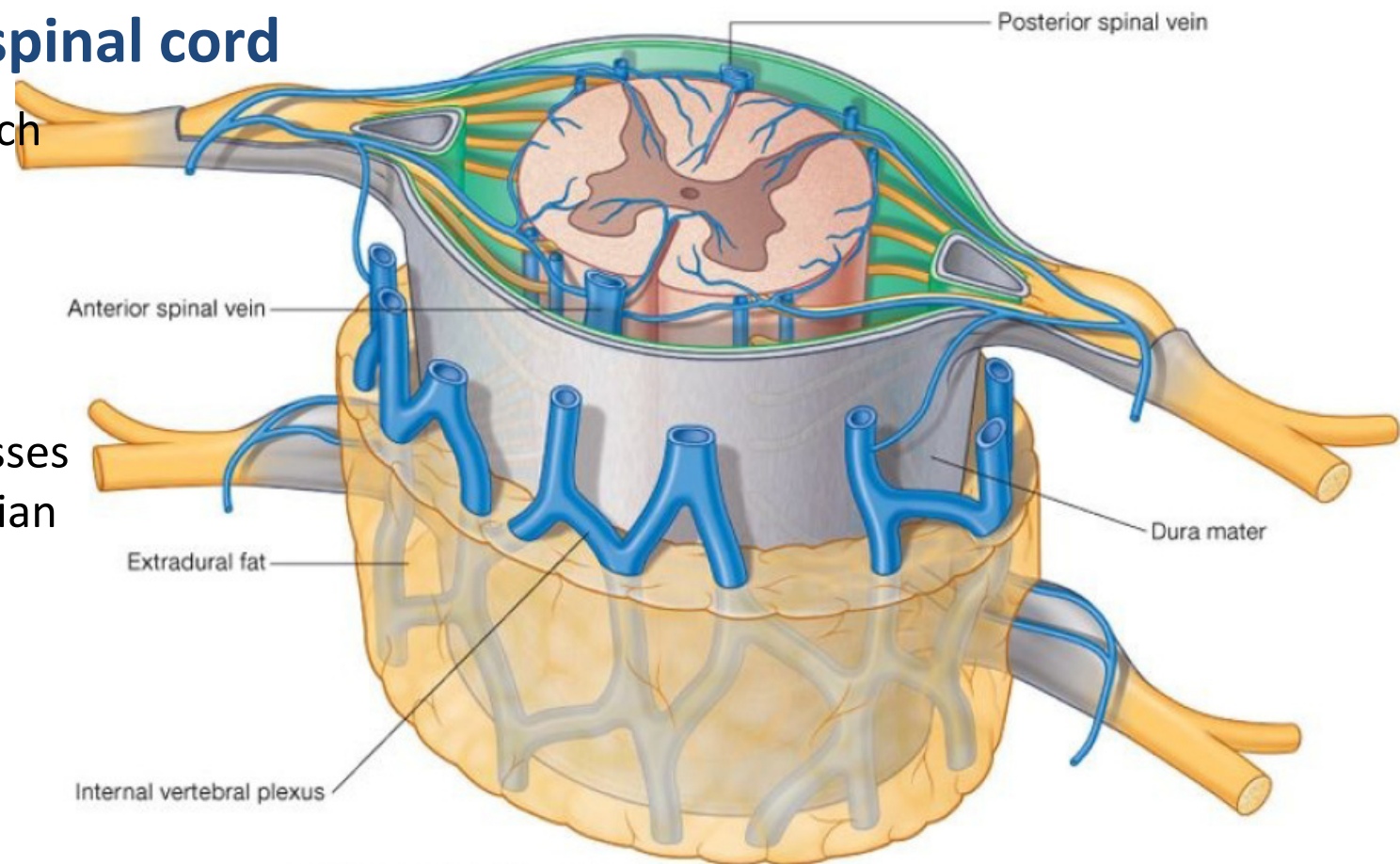
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 - **Segmental medullary arteries**
- **Artery of Adamkiewicz**



Venous drainage of spinal cord

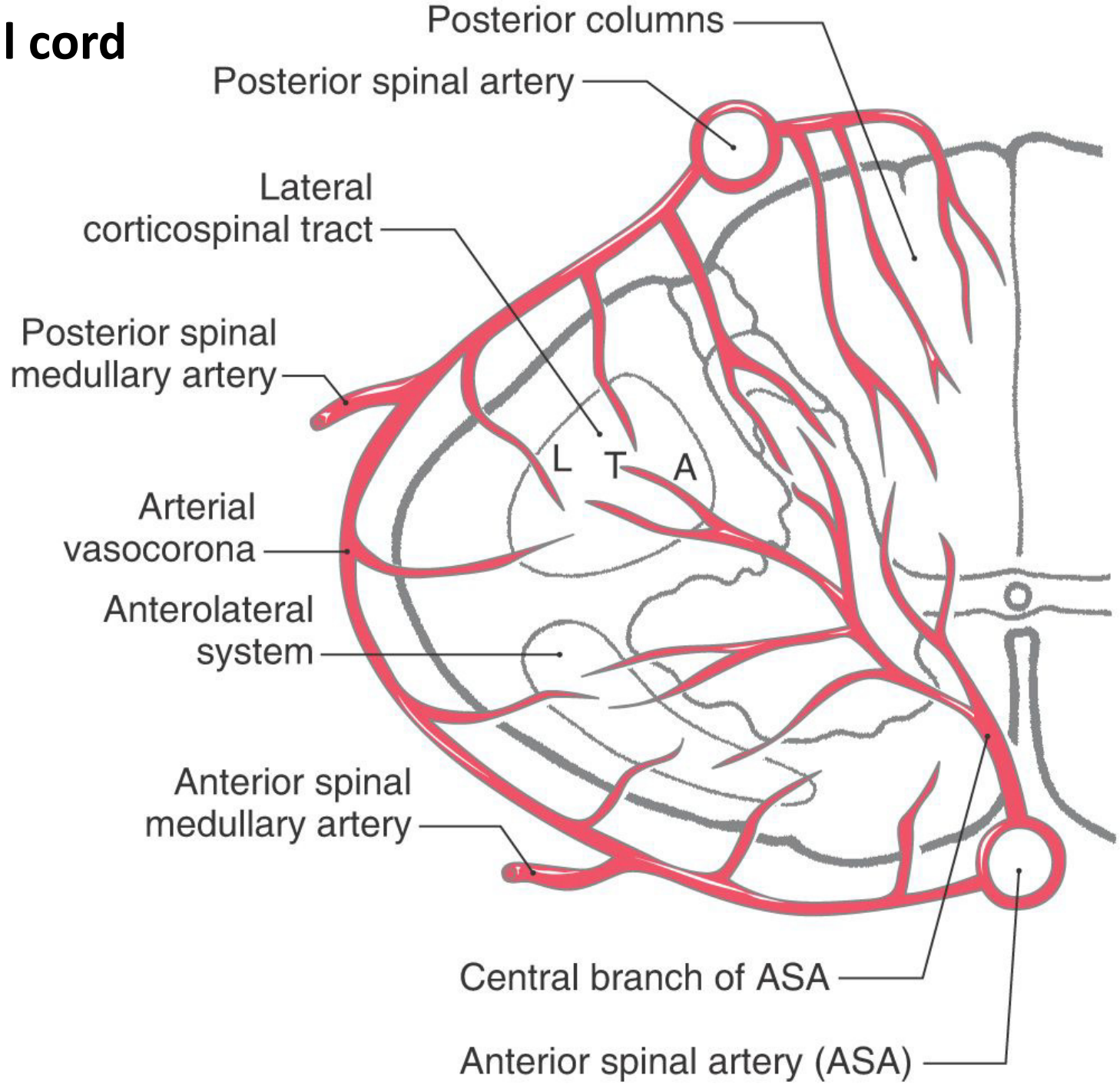
- Two pairs of veins on each side
- One midline channel parallels the anterior median fissure
- One midline channel passes along the posterior median sulcus



- Drain into an extensive internal vertebral plexus in the extradural (epidural) space of the vertebral canal
- Then drains into segmentally arranged vessels that connect with major systemic veins
 - Azygos system in the thorax.
 - The internal vertebral plexus
 - Intracranial veins

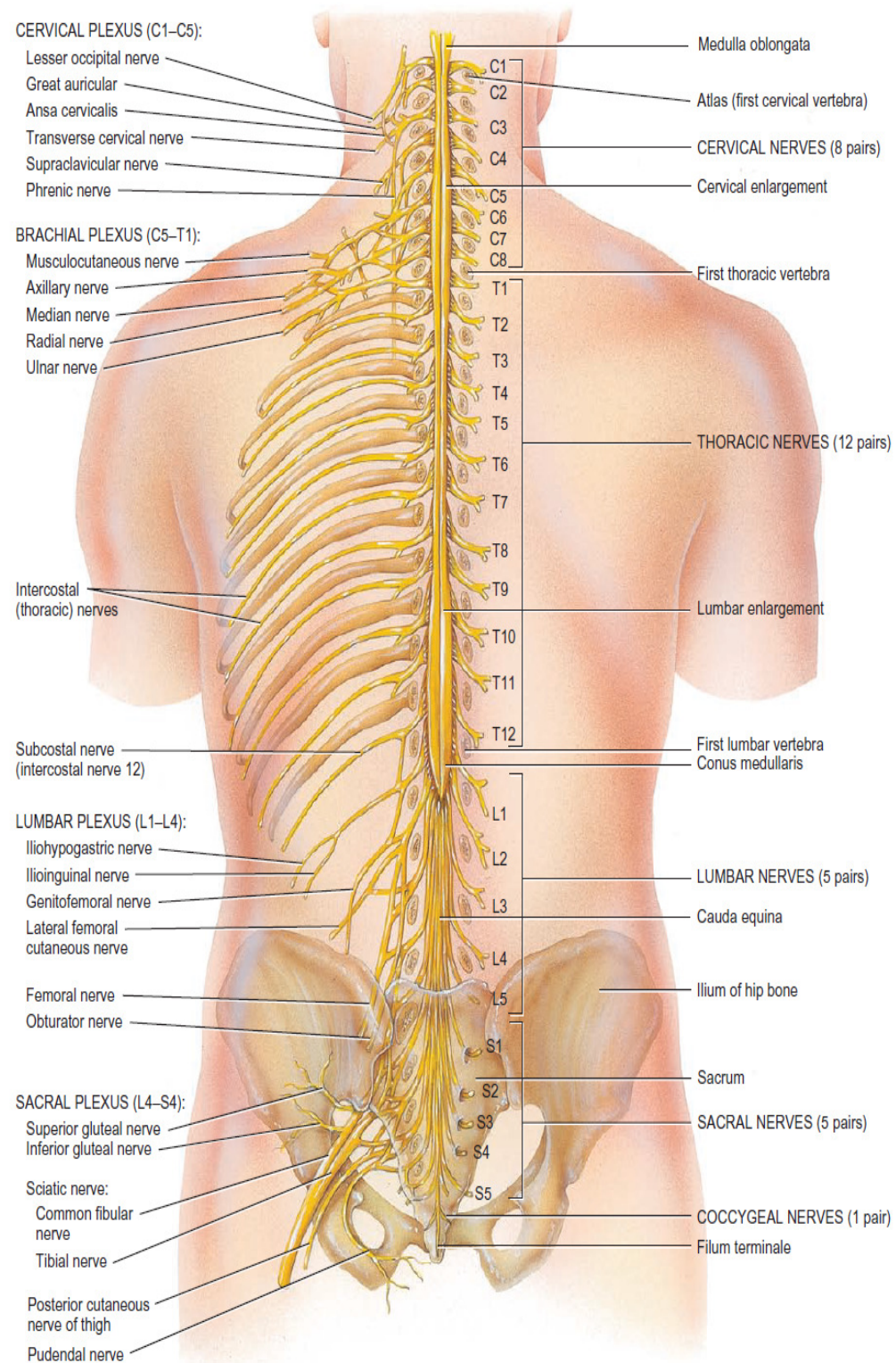
Blood supply of spinal cord

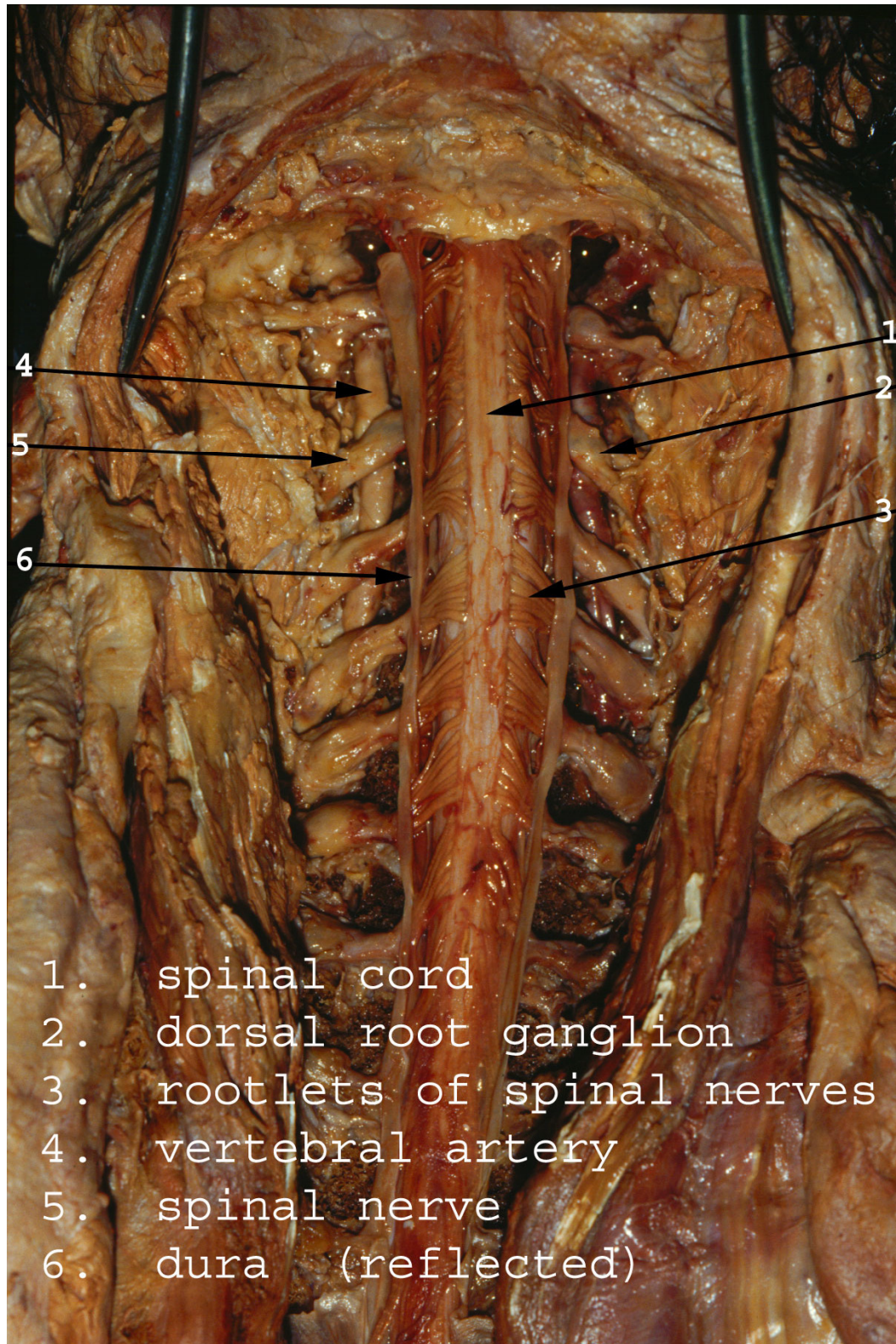
- Terminal branches of the spinal medullary arteries join to form **arterial vasocorona**.
- **The posterior spinal arteries and arterial vasocorona** : The posterior columns and peripheral parts of the lateral and anterior funiculi
- **The anterior spinal artery**: Most of the gray matter and the adjacent parts of the white matter



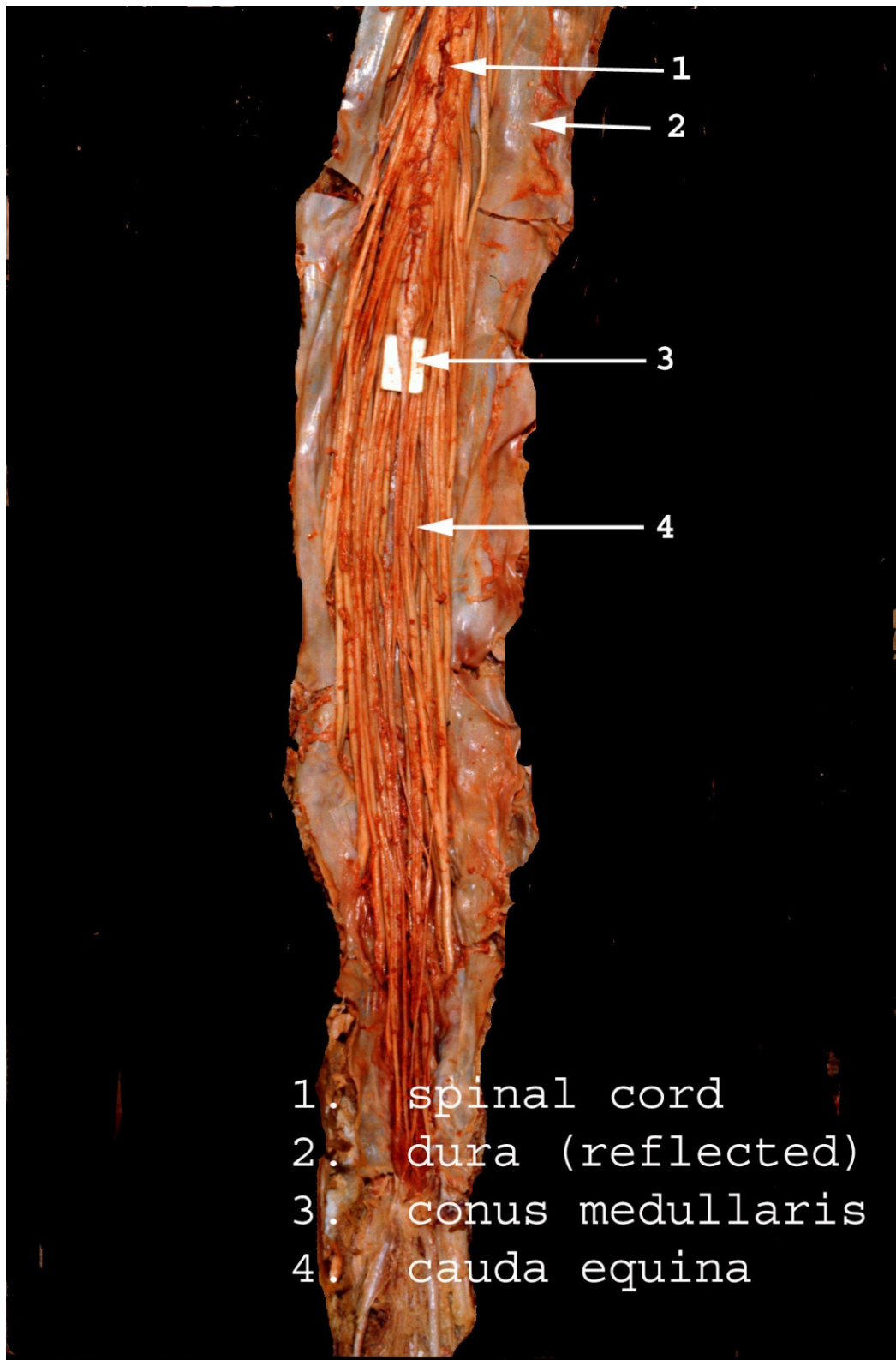
External anatomy of Spinal Cord

- Runs through the vertebral canal
- Extends from foramen magnum to second lumbar vertebra
- Regions
 - Cervical (8)
 - Thoracic (12)
 - Lumbar (5)
 - Sacral (5)
 - Coccygeal (1)
- Gives rise to (31) pairs of spinal nerves
 - All are *mixed* nerves
- Not uniform in diameter
 - Cervical enlargement: supplies upper limbs
 - Lumbar enlargement: supplies lower limbs





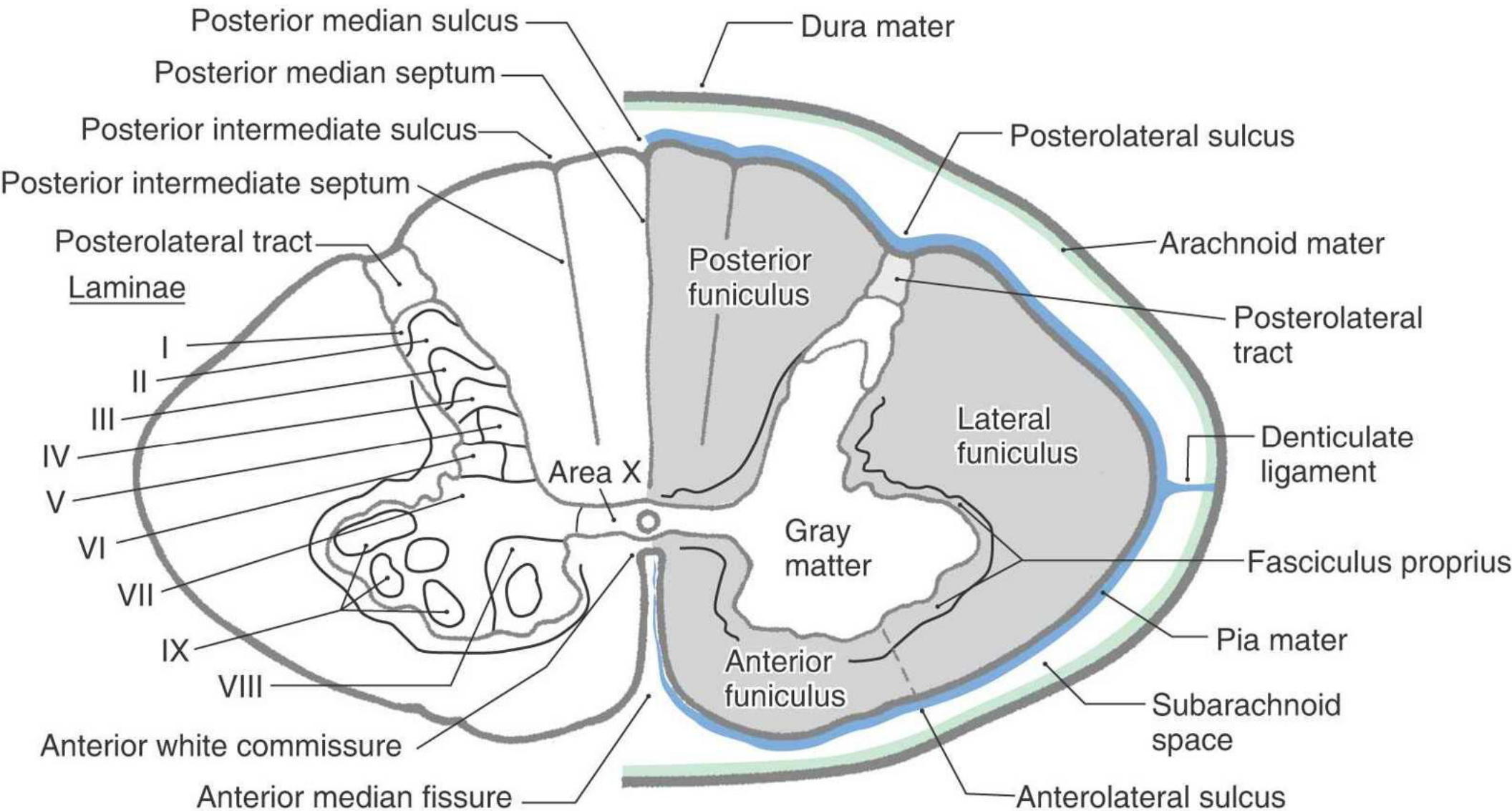
1. spinal cord
2. dorsal root ganglion
3. rootlets of spinal nerves
4. vertebral artery
5. spinal nerve
6. dura (reflected)



1. spinal cord
2. dura (reflected)
3. conus medullaris
4. cauda equina

Cross Section of Spinal Cord

- |



Rexed laminae

- **Lamina 1** relay information related to pain and temperature
- **Lamina 2:** relay information related to pain and temperature (**pain modulation**)
- **Lamina 3 and 4:** nucleus proprius; these laminae have many interneurons

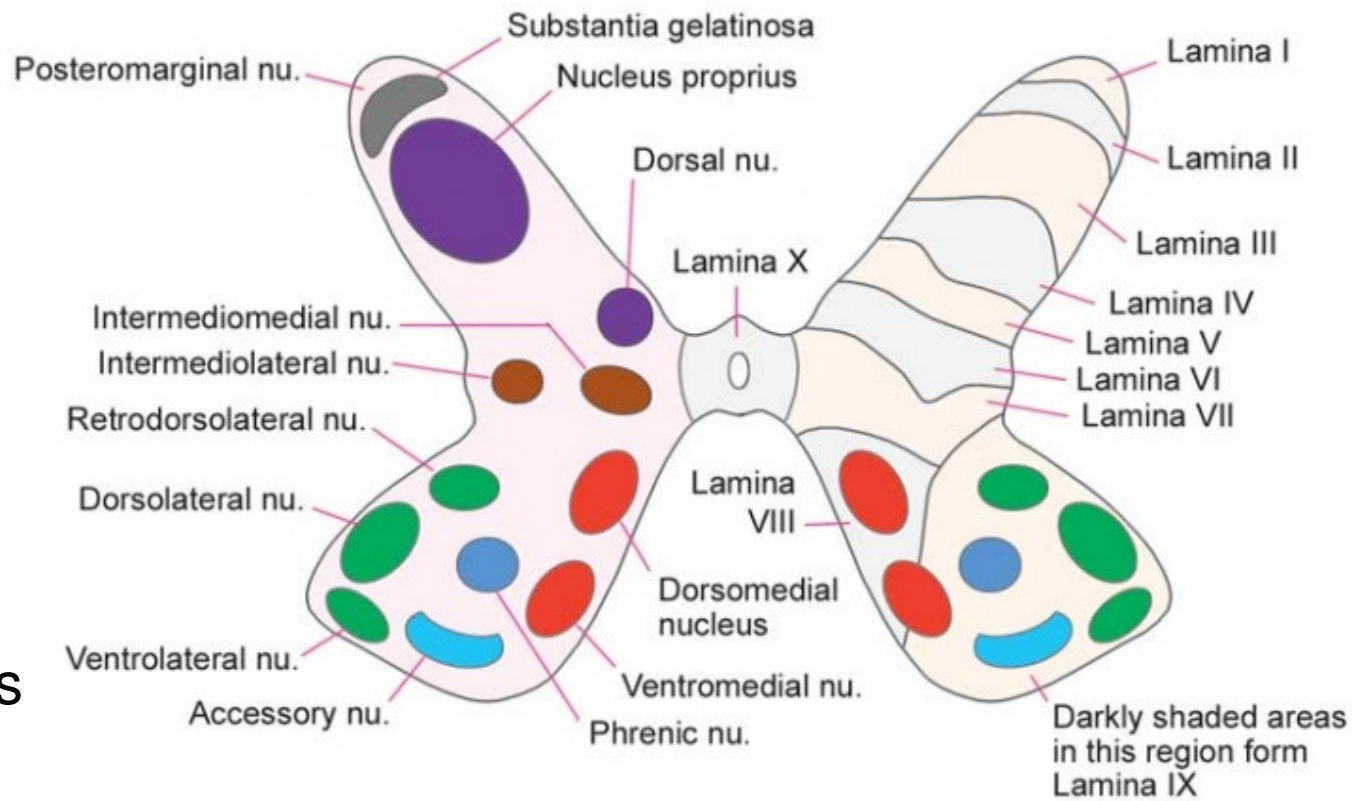


Fig. 5.2. Subdivisions of the grey matter of the spinal cord. The left half of the figure shows the cell groups usually described. The right half shows the newer concept of laminae.

- **Lamina 5:** relay information related to pain and temperature
- **Lamina 6:** presents only at the cervical and lumbar enlargements and receives proprioception
- **Lamina 7: Intermedio-lateral** nucleus, contains preganglionic fibers of sympathetic (T1 -L2). **Intermedio-medial nucleus**, all over the spinal cord, receive visceral pain. **Dorsal nucleus of Clark's** presents at (C8 – L2 or T1-L4), relay center for **unconscious proprioception**

Rexed laminae

- **Lamina 8:** motor interneurons, Commissural nucleus
- **Lamina 9:** ventral horn, LMN, divided into nuclei:
 - **Ventromedial:** all segments (extensors of vertebral column)
 - **Dorsomedial:** (T1-L2) intercostals and abdominal muscles
 - **Ventrolateral:** C5-C8 (arm) L2-S2 (thigh)
 - **Dorsolateral:** C5-C8 (Forearm), L3-S3 (Leg)
 - **Reterodorsolateral:** C8-T1 (Hand), S1-S2 (foot)
 - **Central:** Phrenic nerve (C3-C5)
- **Lamina X:** Surrounds the central canal – the grey commissure

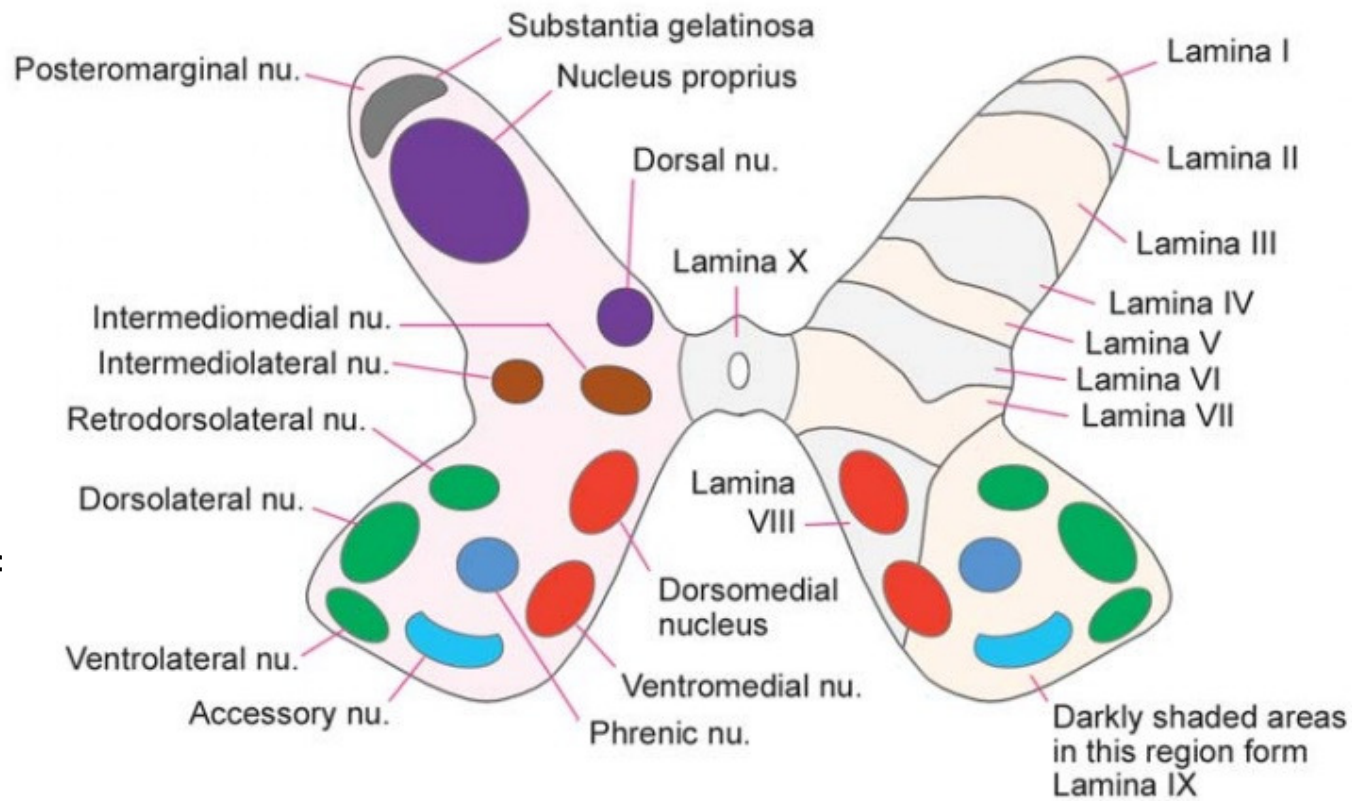
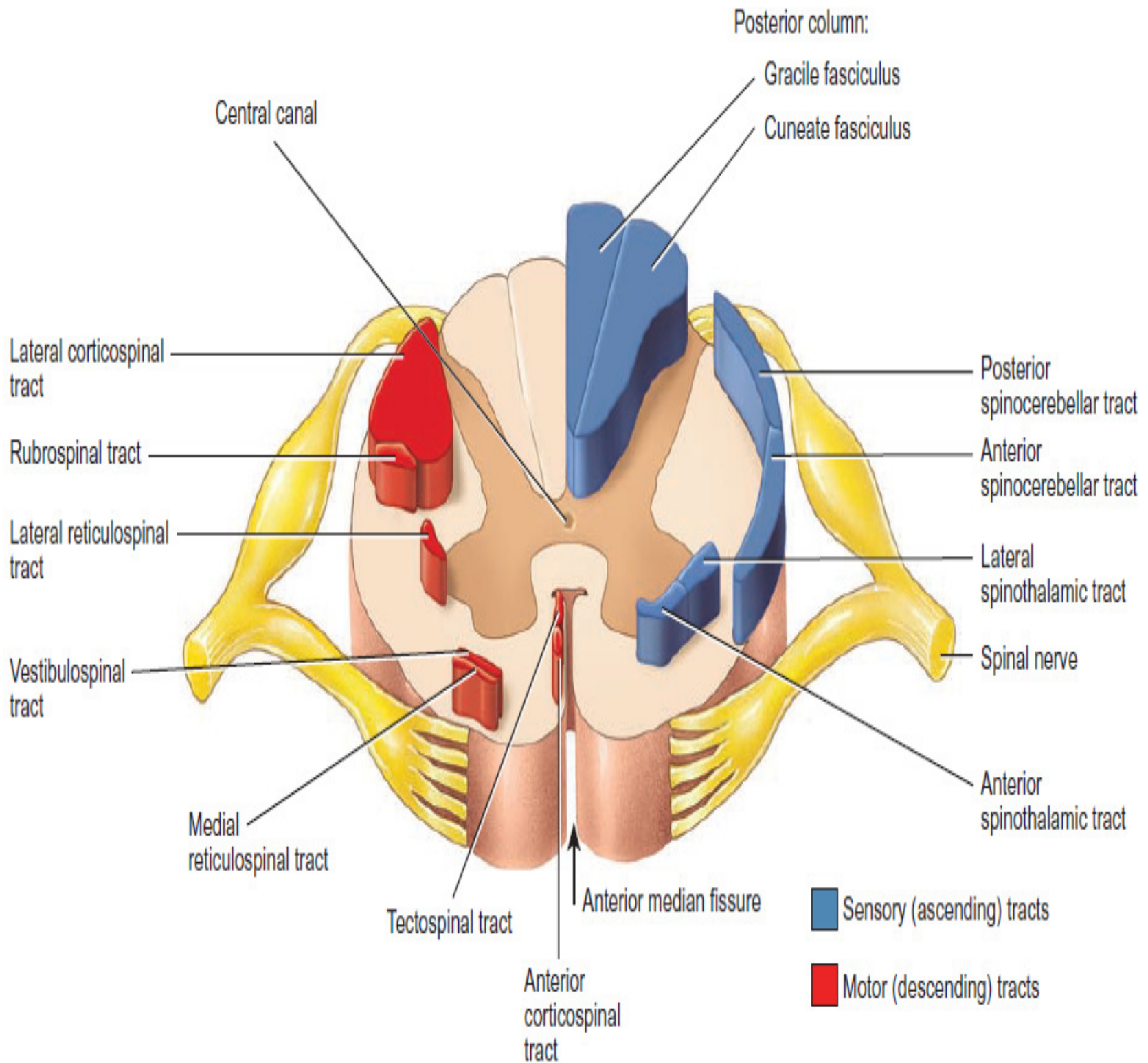


Fig. 5.2. Subdivisions of the grey matter of the spinal cord. The left half of the figure shows the cell groups usually described. The right half shows the newer concept of laminae.



cervical segment

- oval shape
- Large white matter funiculi
- prominent, broad anterior gray horns that contain the motor neurons that innervate the upper extremities

thoracic segment

- rounded profile
- small, slender, peglike anterior gray horns
- lateral horns are unique to thoracic segments

Lumbar segment

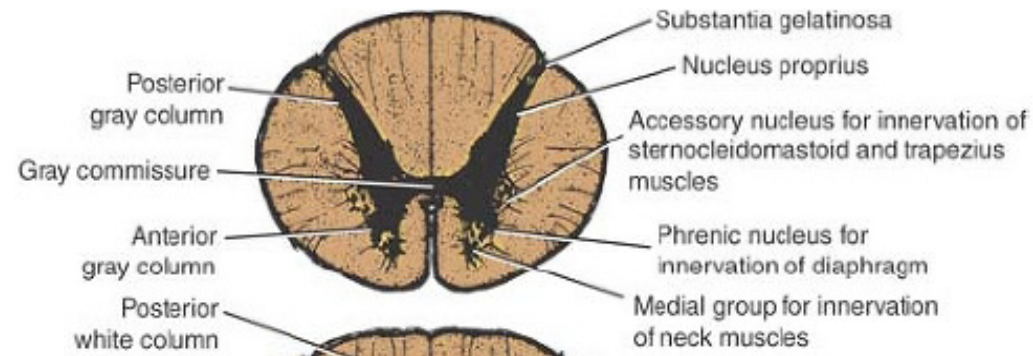
- Rounded to oval
- has very large anterior gray horns (motor supply to the lower extremities)

- only a very small surrounding of white matter

Sacral segment

- Rounded
- only a very small surrounding of white matter
- Parasympathetic outflow

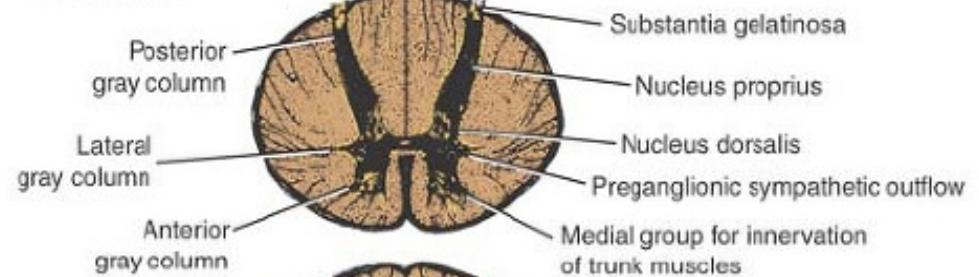
Third cervical segment



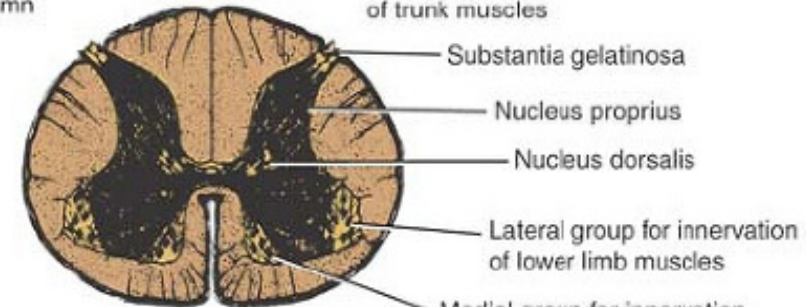
Sixth cervical segment



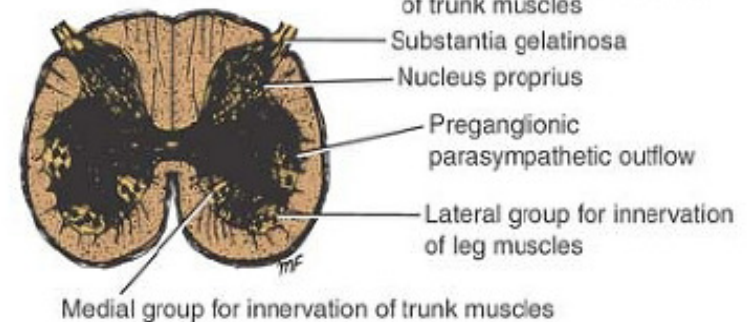
Sixth thoracic segment



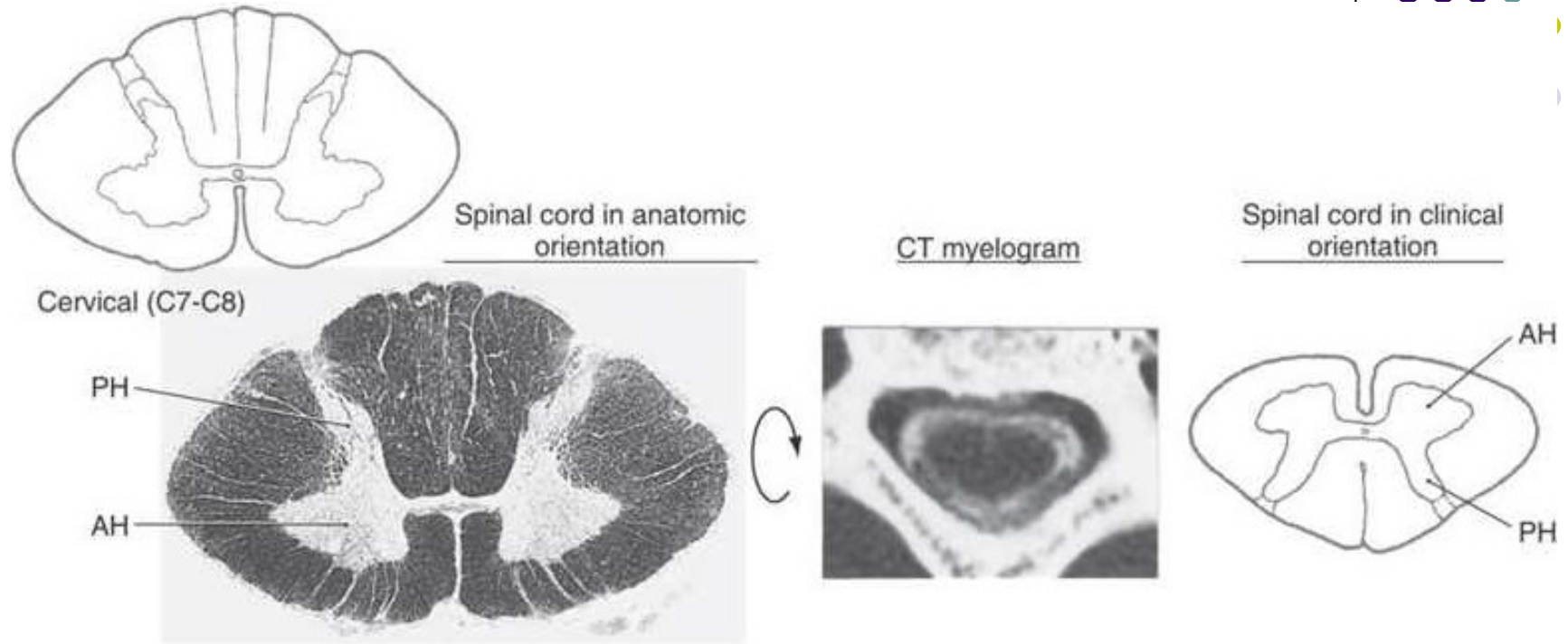
Third lumbar segment



Third sacral segment



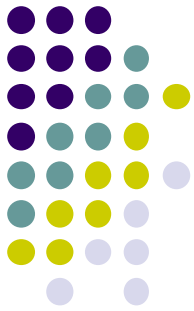
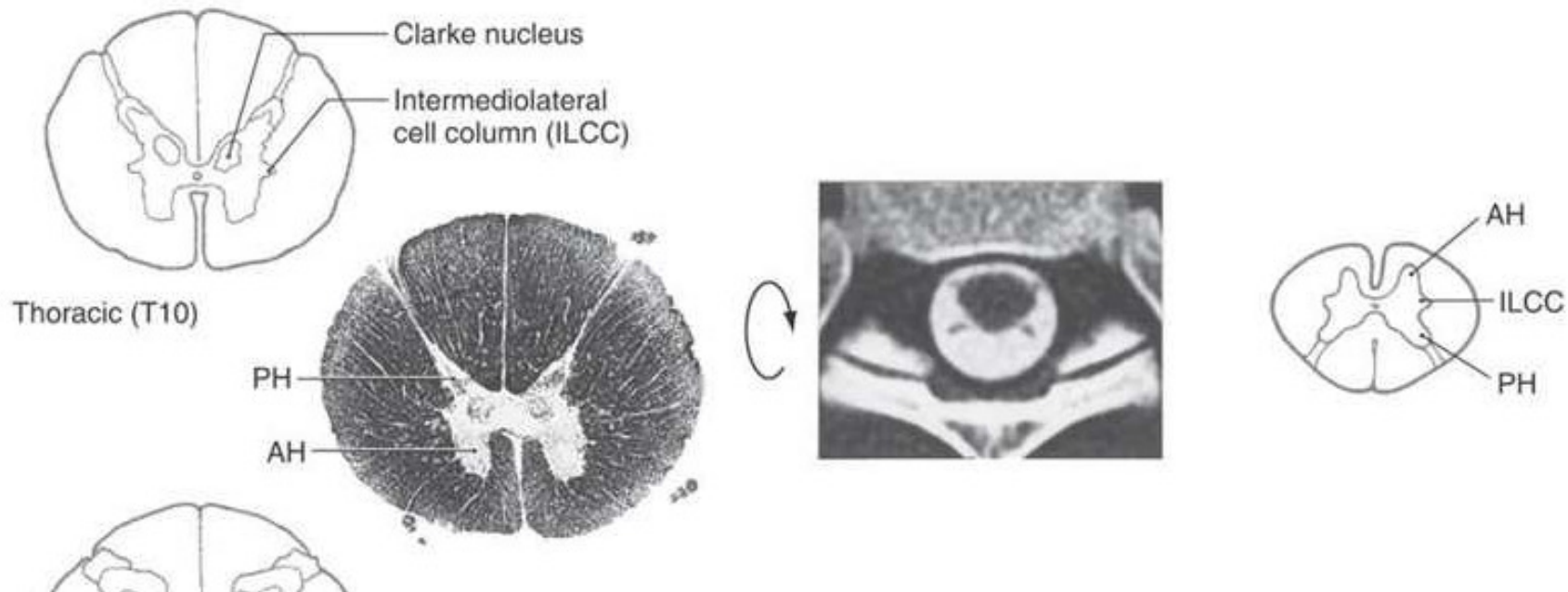
cervical segment



cervical segment

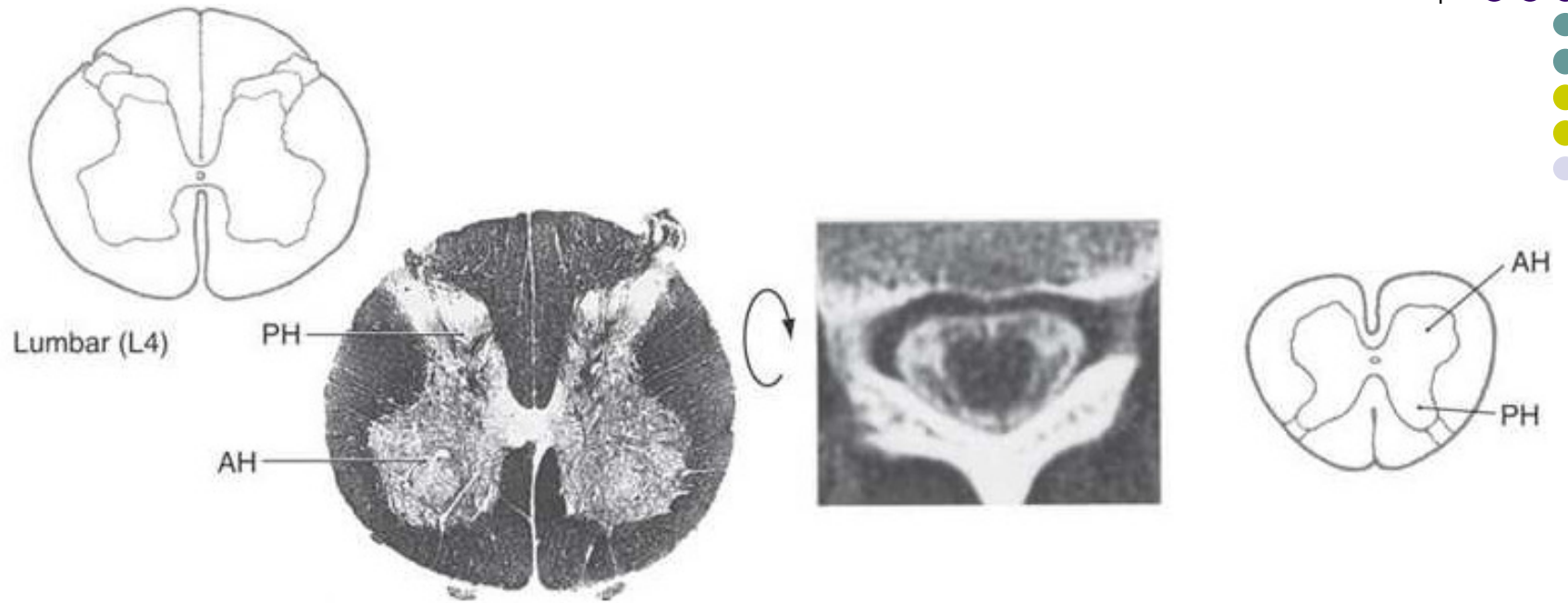
- oval shape (C4-C8)
- At cervical levels C1 to C3 (more rounded)
- Large white matter funiculi
- prominent, broad anterior gray horns that contain the motor neurons that innervate the upper extremities
-

Thoracic segment



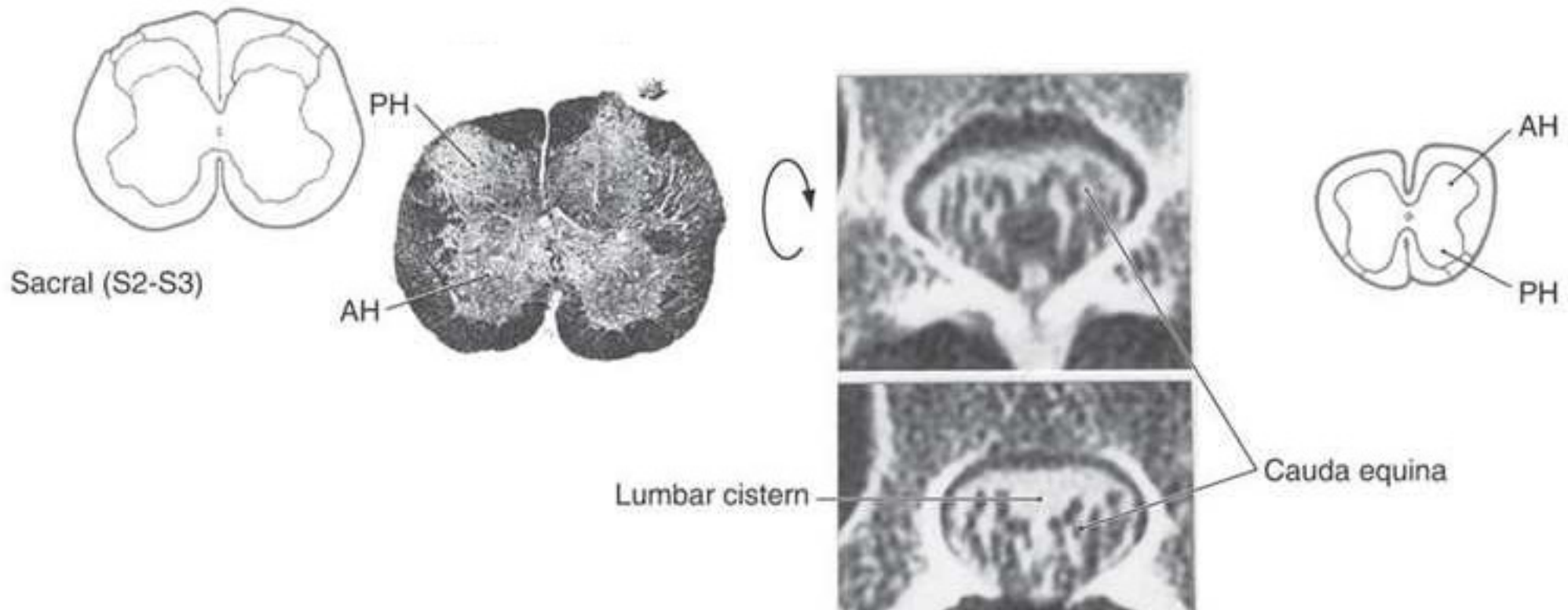
- Rounded profile
- Small, slender, peglike anterior gray horns
- Lateral horns are unique to thoracic segments
- only the gracile fasciculus is present at lower thoracic levels (below T6)

Lumbar segment

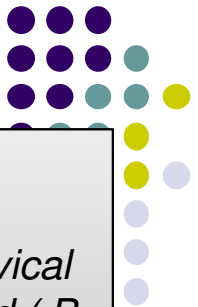


- Rounded to oval
- Has very large anterior gray horns (motor supply to the lower extremities)
- only a very small surrounding of white matter

Sacral segment



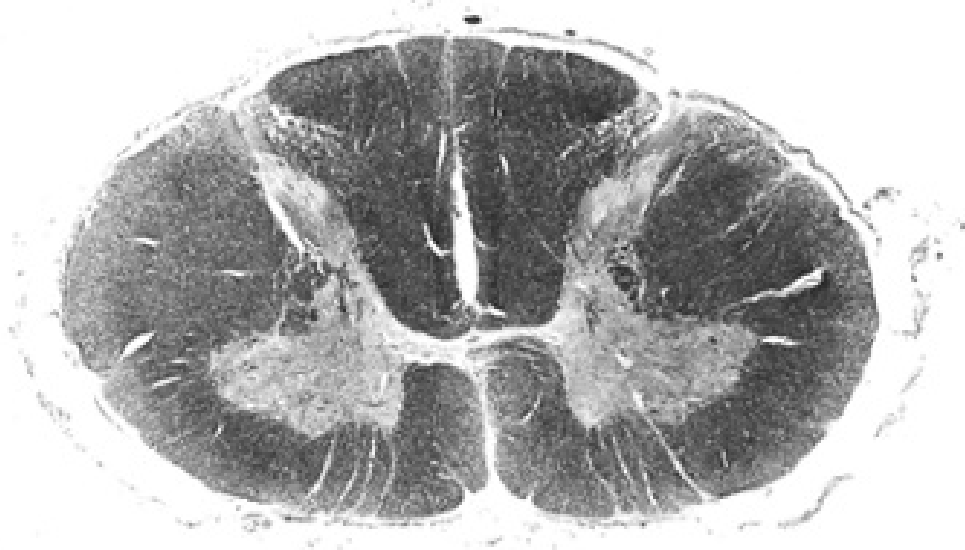
- Rounded
- Mainly gray matter (only a very small surrounding of white matter)
- Levels S2, S3, and S4 contains preganglionic parasympathetic cell bodies (the sacral visceromotor nucleus).



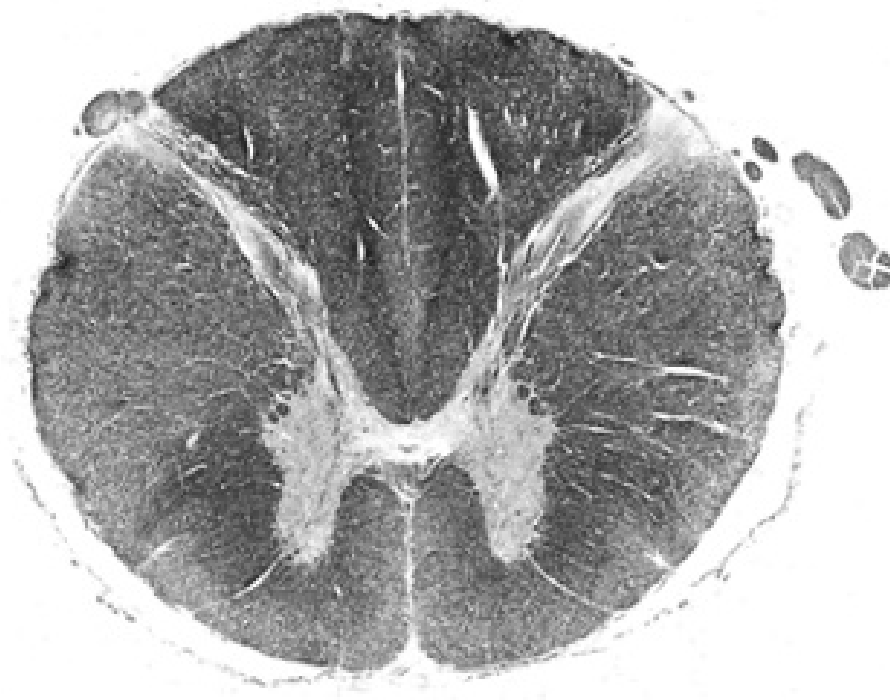
Regional variation of spinal cord structure

cross sections taken from the cervical enlargement (A), midthoracic cord (B), and lumbosacral enlargement (C)

A



B



C



Clinical significance of lamination of the ascending tracts

- Any external pressure exerted on the spinal cord in the region of the spinothalamic tracts will first experience a loss of pain and temperature sensations in the sacral dermatome of the body
- If pressure increases the other higher segmental dermatomes will be affected

❖ Remember that in the spinothalamic tracts the cervical to sacral segments are located medial to lateral

- **Intramedullary tumor:** affect the cervical fibers (Medial)
- **Extramedullary tumor** would affect lower limb fibers (lateral).
- ❑ **Sacral sparing:** Occur at intramedullary tumor

