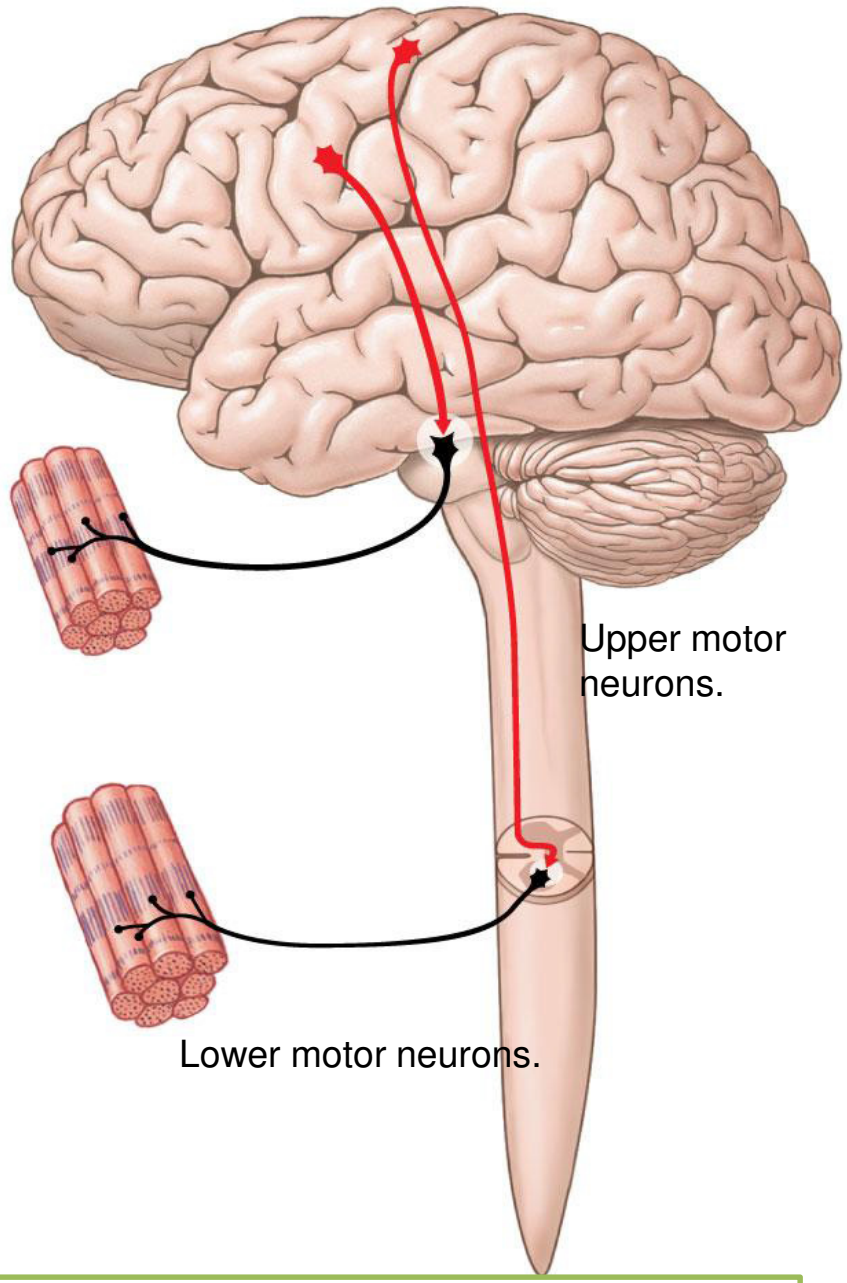
COMPARISON BETWEEN UMN AND LMN

Features	Upper motor neuron lesions(UMN)	Lower motor neuron lesion(LMN)
	UMN starts from motor cortex to the cranial nerve nuclei in brain and anterior horn cells in spinal cord	LMN is the motor pathway from anterior horn cell(or Cranial nerve nucleus)via peripheral nerve to the motor end plate
Bulk of muscles	No wasting	Wasting of the affected muscles (atrophy)
Tone of muscles	Tone increases (Hypertonia)	Tone decreases (Hypotonia)
Power of muscles	Paralysis affects movements of group of muscles Spastic/ clasp knife	Individual muscles is paralyzed Flaccid (flaccid paralysis)
Reflexes	Exaggerated. (Hyperreflexia)	diminished or absent. (Hyporeflexia)
Fasciculation	Absent	Present
Babinski sign	Present	Absent
clasp-knife reaction	Present	Absent
Clonus	Present	Absent

hypertonia and hyperreflexia, is the result of an increase in gamma motor neurons activity

Motor tracts

- There are two major descending tracts
- **Pyramidal tracts** (Corticospinal) : Conscious control of skeletal muscles
- **Extrapyramidal:** Subconscious regulation of balance, muscle tone, eye, hand, and upper limb position:
  - **Vestibulospinal tracts**
  - **Reticulospinal tracts**
  - **Rubrospinal tracts**
  - **Tectospinal tracts**



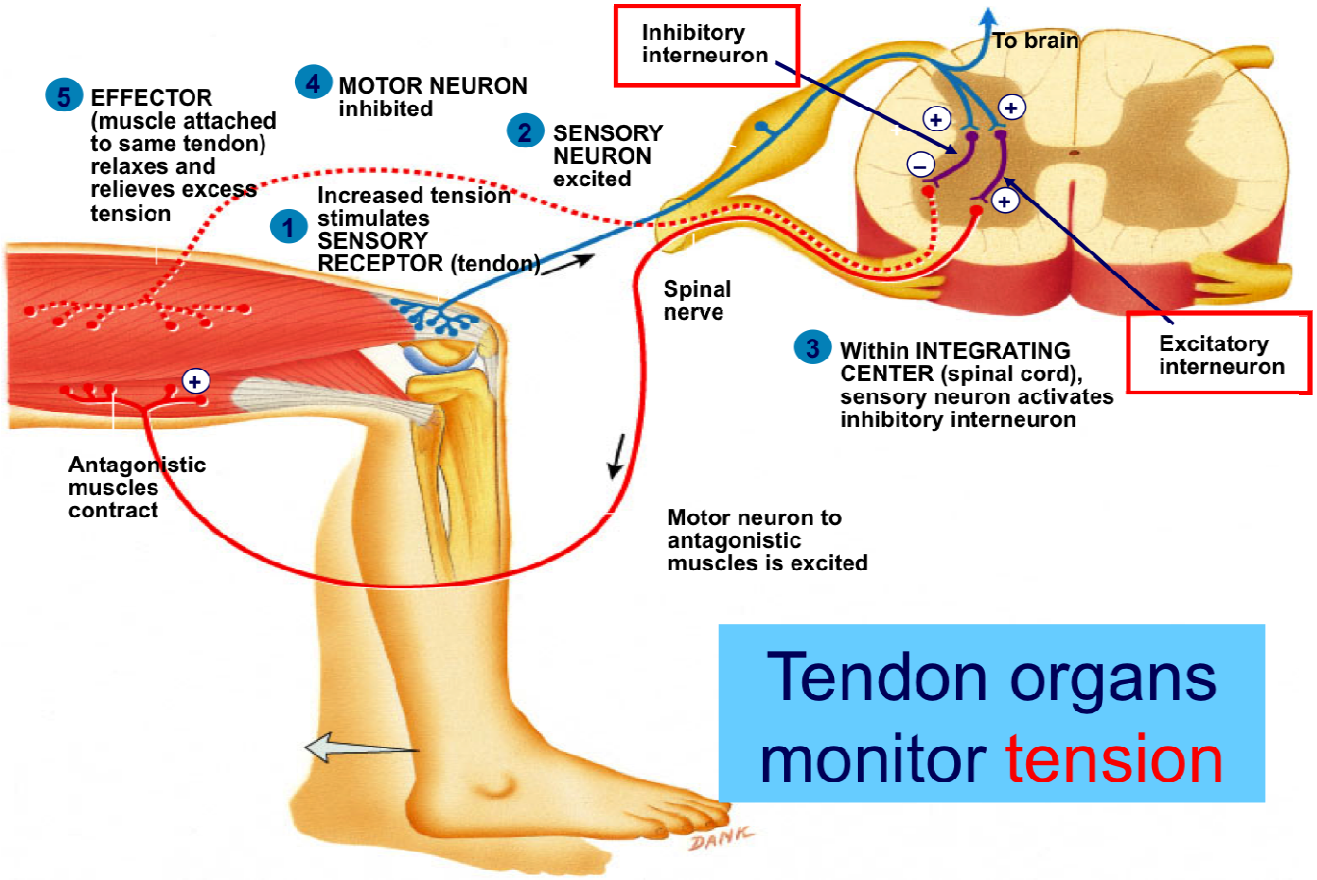
Extrapyramidal tracts arise in the brainstem, but are under the influence of the cerebral cortex

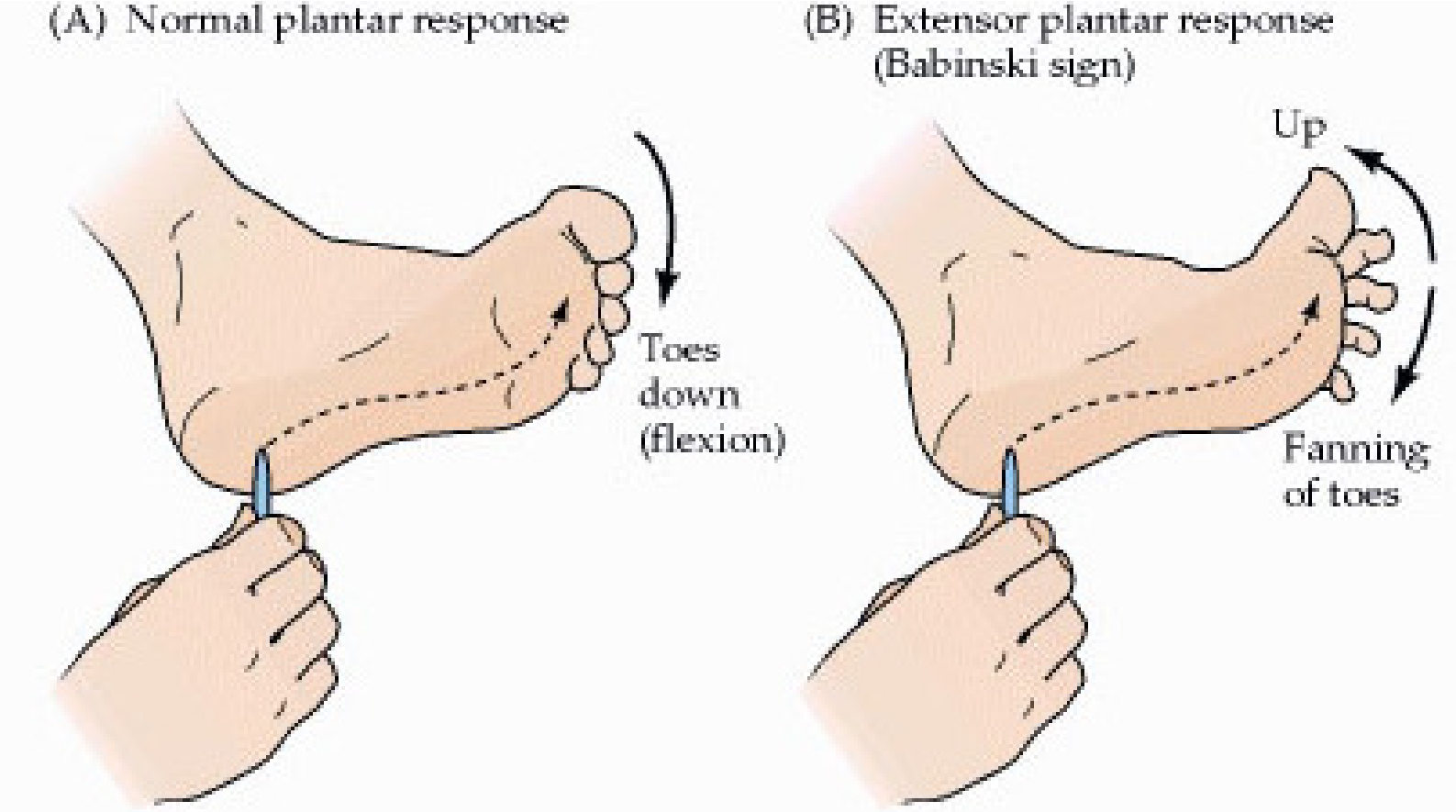
Clasp knife reaction

- Overactivity of the pointine excitatory system (spasticity)
- **Initial resistance:** Exaggerated stretch reflex
- **Sudden release:** After applying pressure, the tension in the muscle will increase and will be enough to activate the **Golgi tendon organs** which will cause the relaxation

Tendon reflex

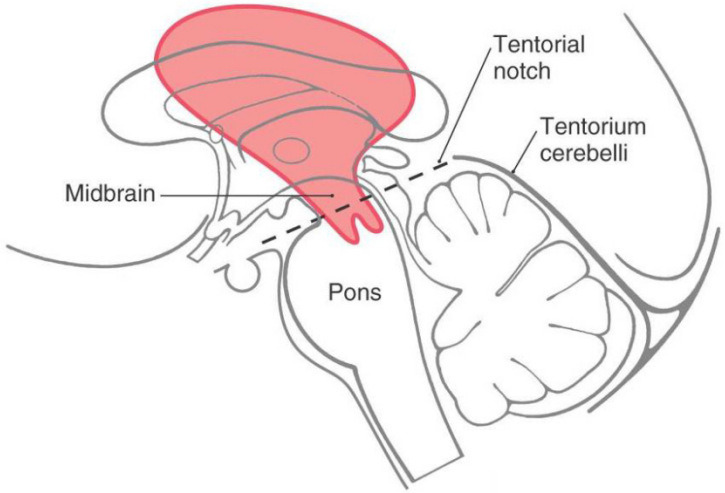
- Polysynaptic reflex arc
- law of reciprocal innervation

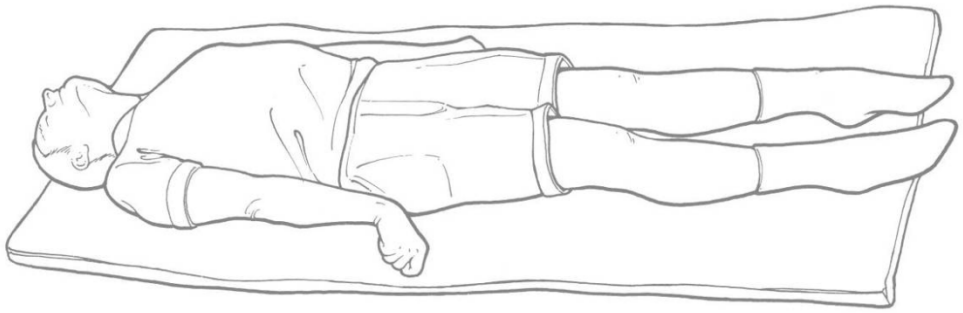




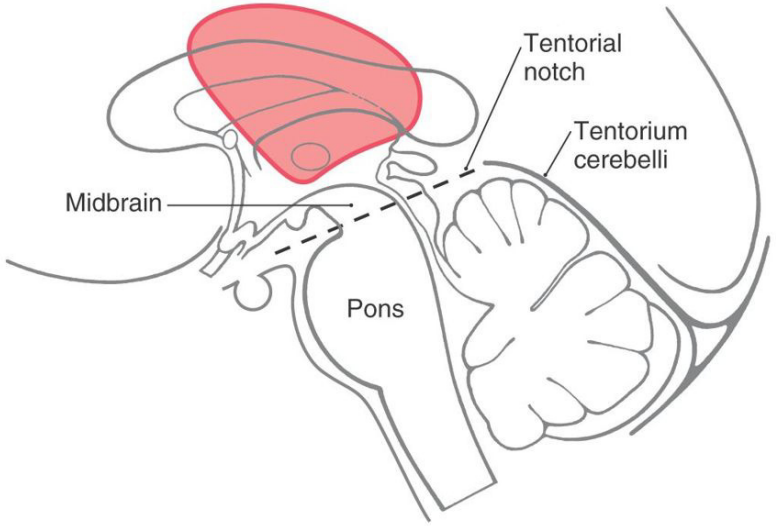
When the corticospinal tracts are nonfunctional, the influence of the other descending tracts on the toes becomes apparent, and a kind of withdrawal reflex takes place in response to stimulation of the sole, with the great toe being dorsally flexed and the other toes fanning out.

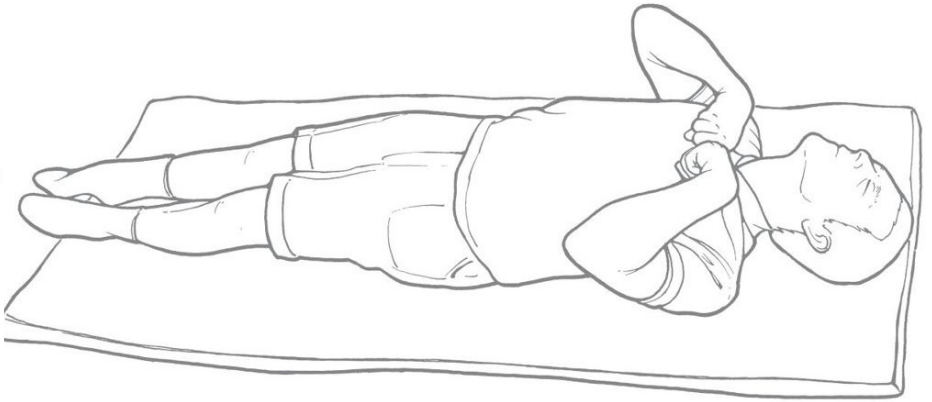
Decerebrate rigidity

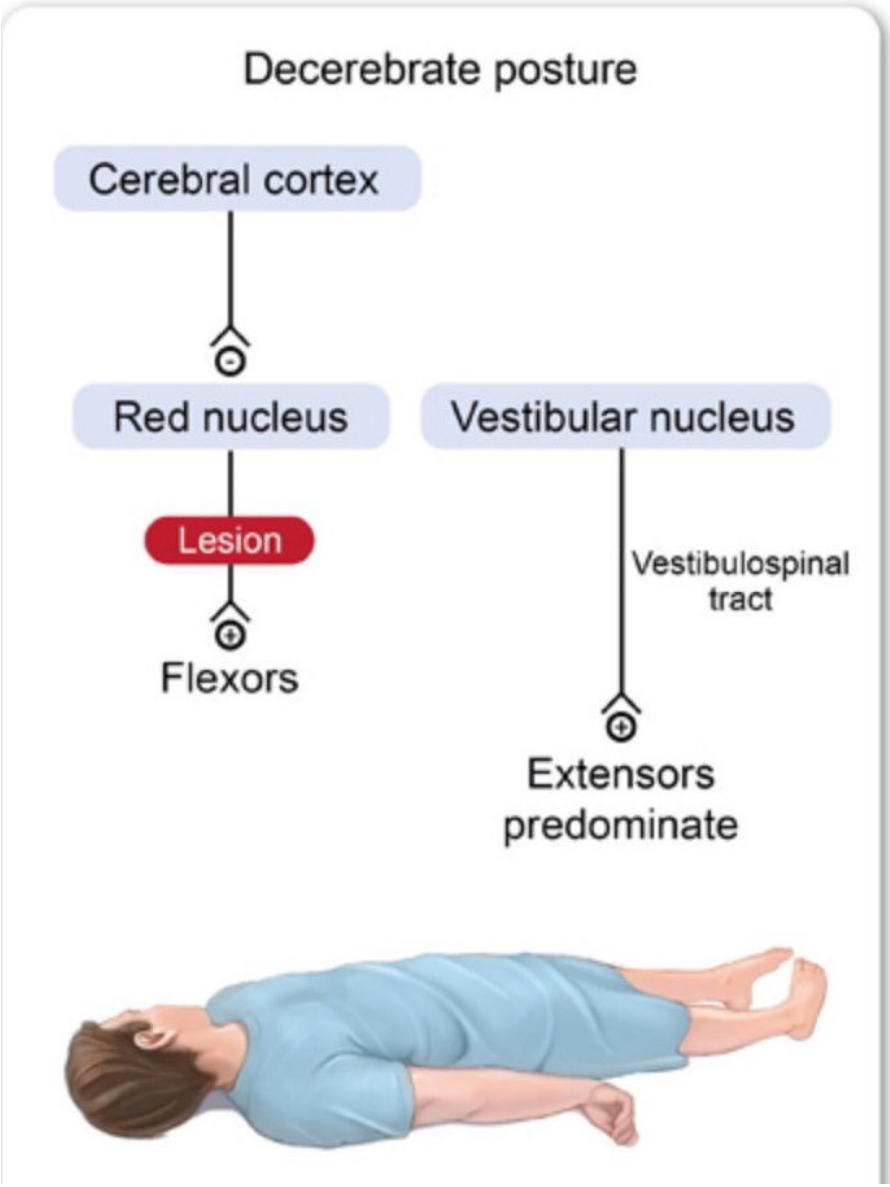


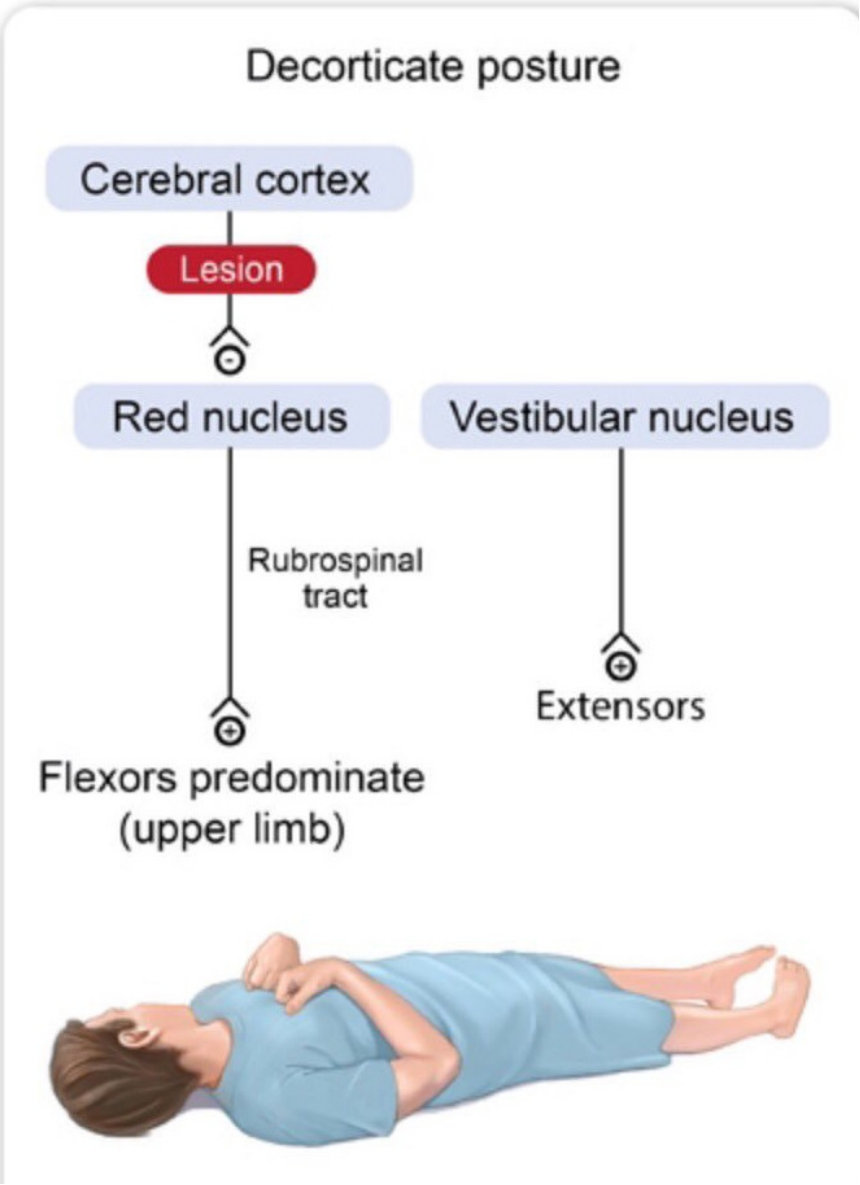


Decorticate rigidity






Decerebrate posture
Cerebral cortex
Red nucleus
Vestibular nucleus
Lesion
Vestibulospinal tract
Flexors
Extensors predominate


Decorticate posture
Cerebral cortex
Lesion
Red nucleus
Vestibular nucleus
Rubrospinal tract
Extensors
Flexors predominate (upper limb)

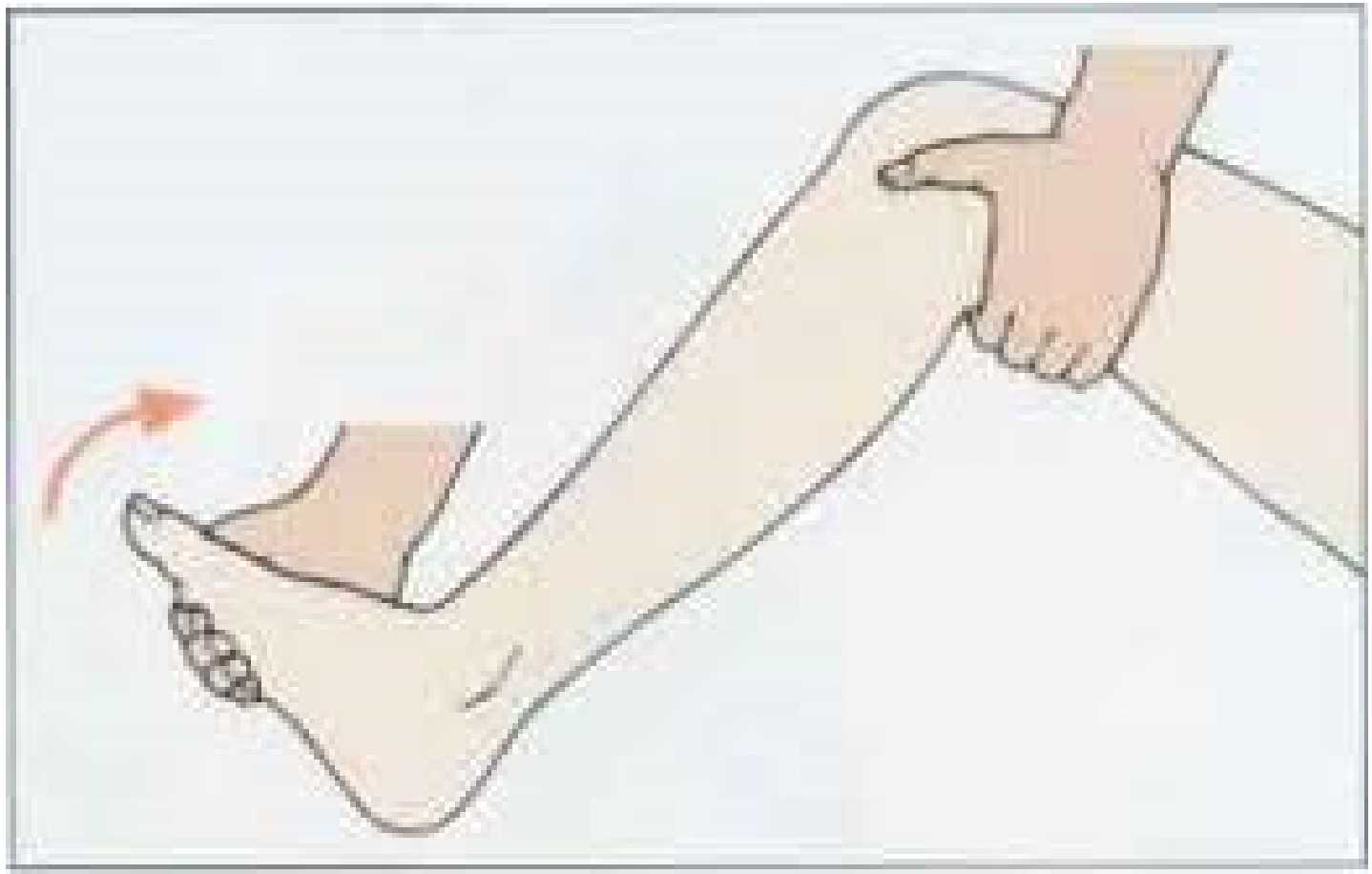


Fig. 6.29 Testing for ankle clonus.

Rhythmic contractions and relaxation of muscles when they are subjected to sudden sustained stretch

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hypertonia and hyperreflexia, is the result of an increase in gamma motor neurons activity

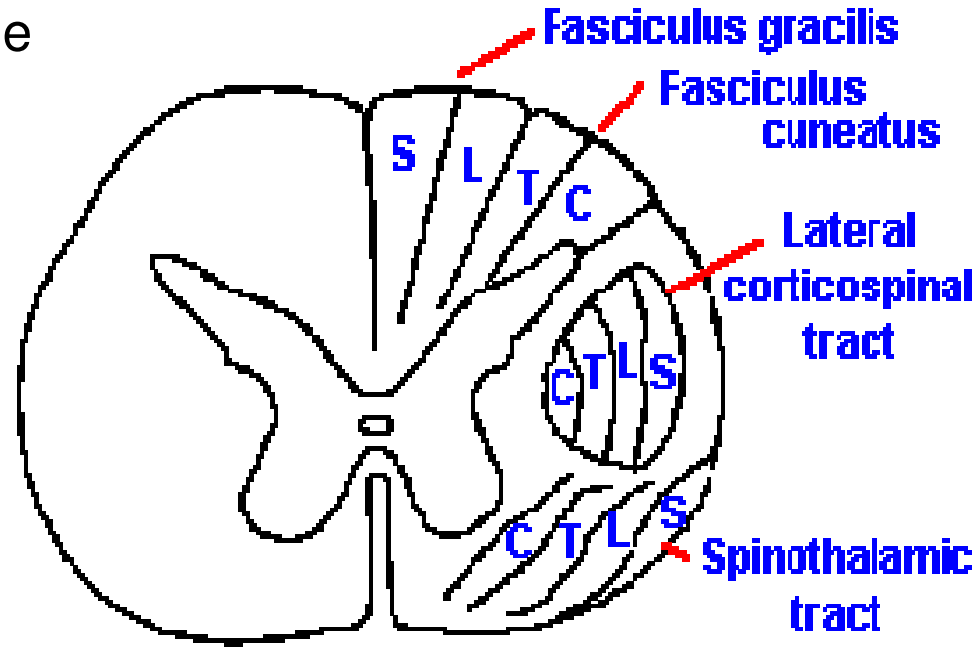
Clinical significance of lamination of the ascending tracts

- 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



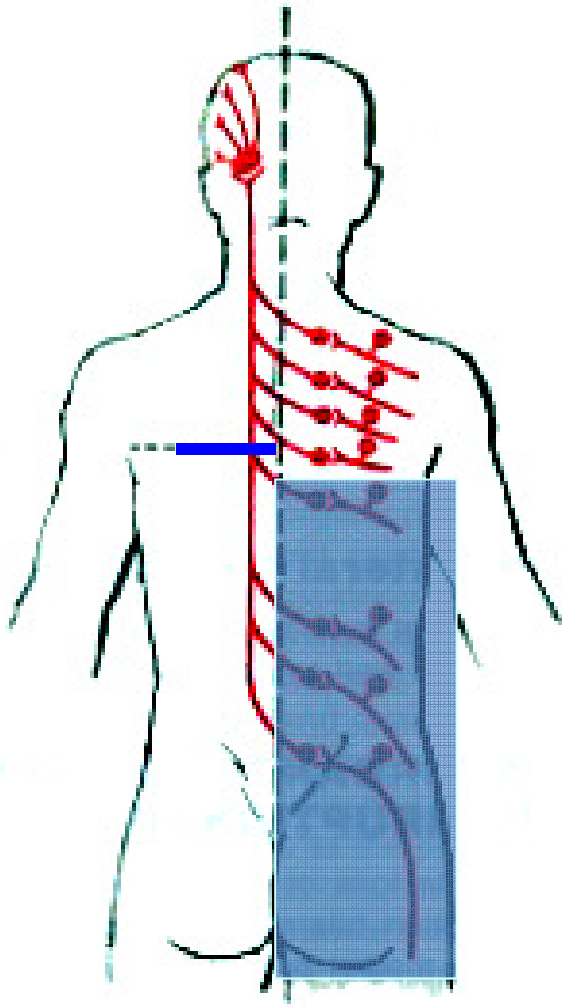
Clinical application

destruction of LSTT

- loss of
  - pain and thermal sensation
  - on the contralateral side
  - below the level of the lesion

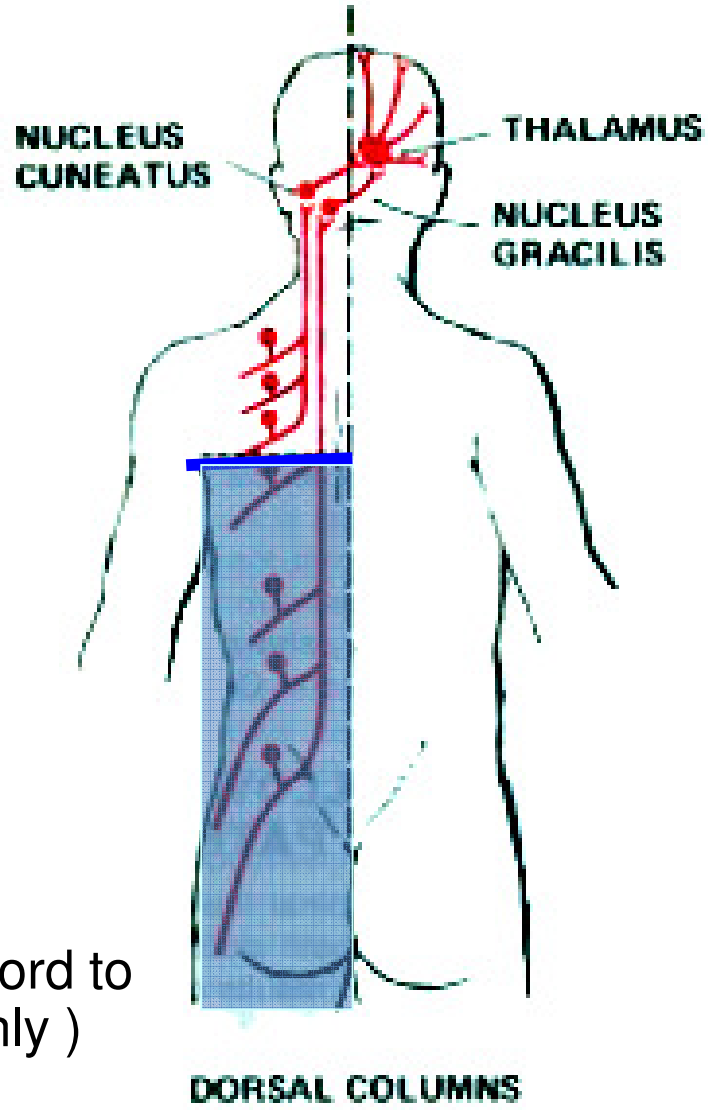
patient will not

recognize hot and cold



Clinical application
destruction of
fasciculus gracilia and cuneatus

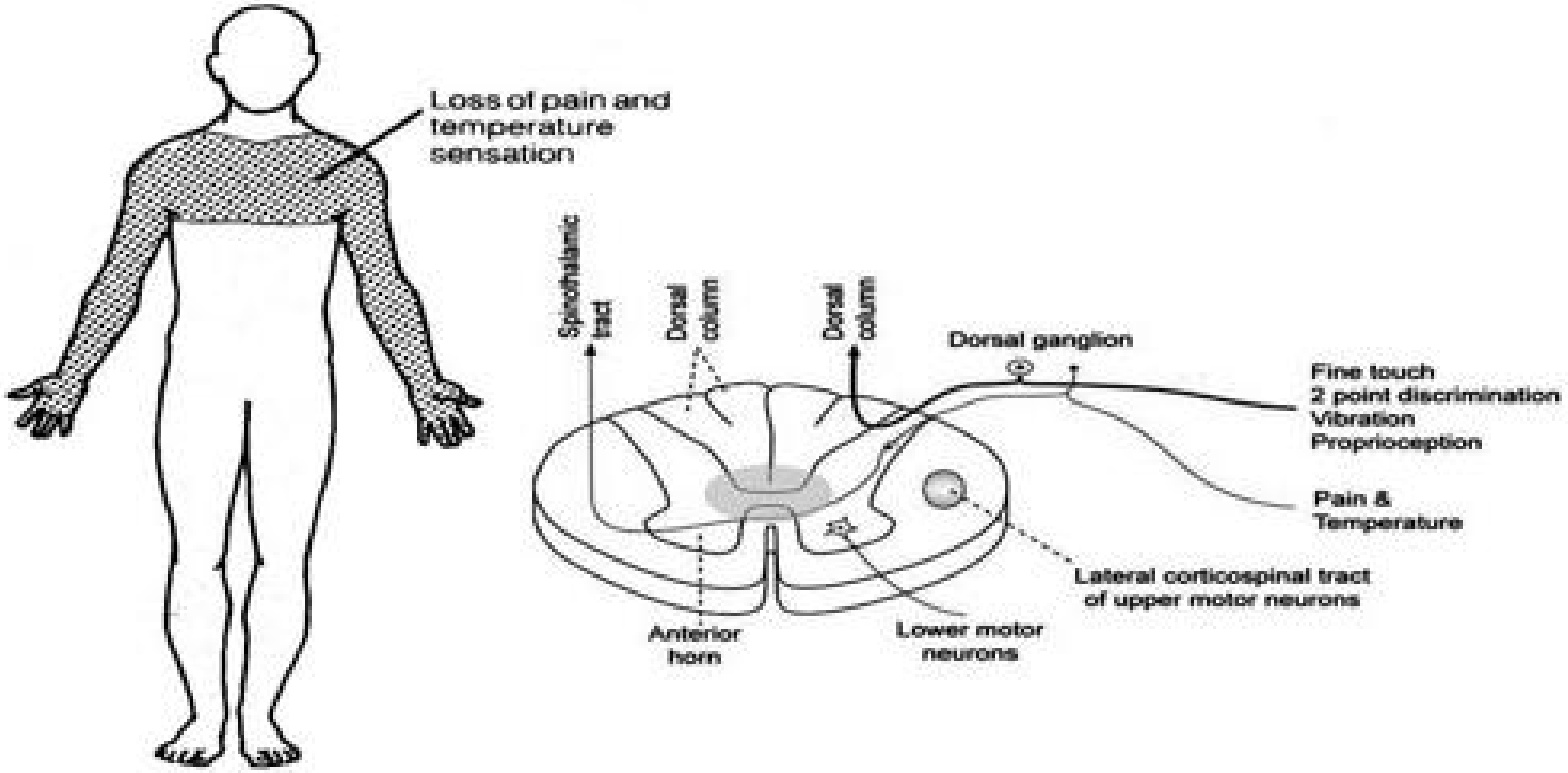
- loss of muscle joint sense, position sense, vibration sense and tactile discrimination
- on the same side
- below the level of the lesion



(extremely rare to have a lesion of the spinal cord to be localized as to affect one sensory tract only)

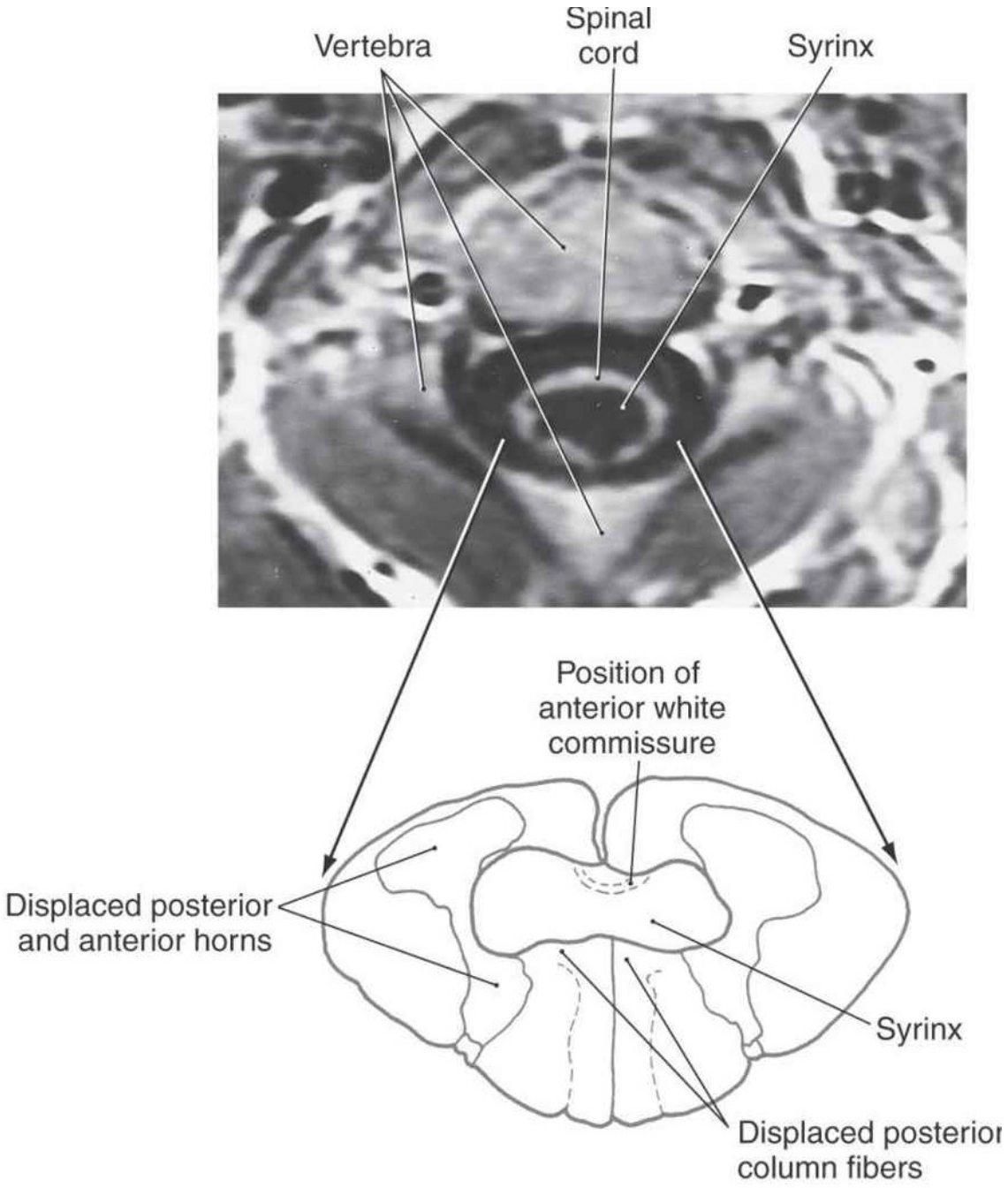
Syringomyelia

- Cavitation of the central regions of the spinal cord
- Damage fibers crossing in the anterior white commissure in both directions
- Bilateral loss of pain and thermal sensations
- When it is located at the C4 to C5 levels of the spinal cord sensory losses in the configuration of a cape draped over the shoulders and extending down to nipple level



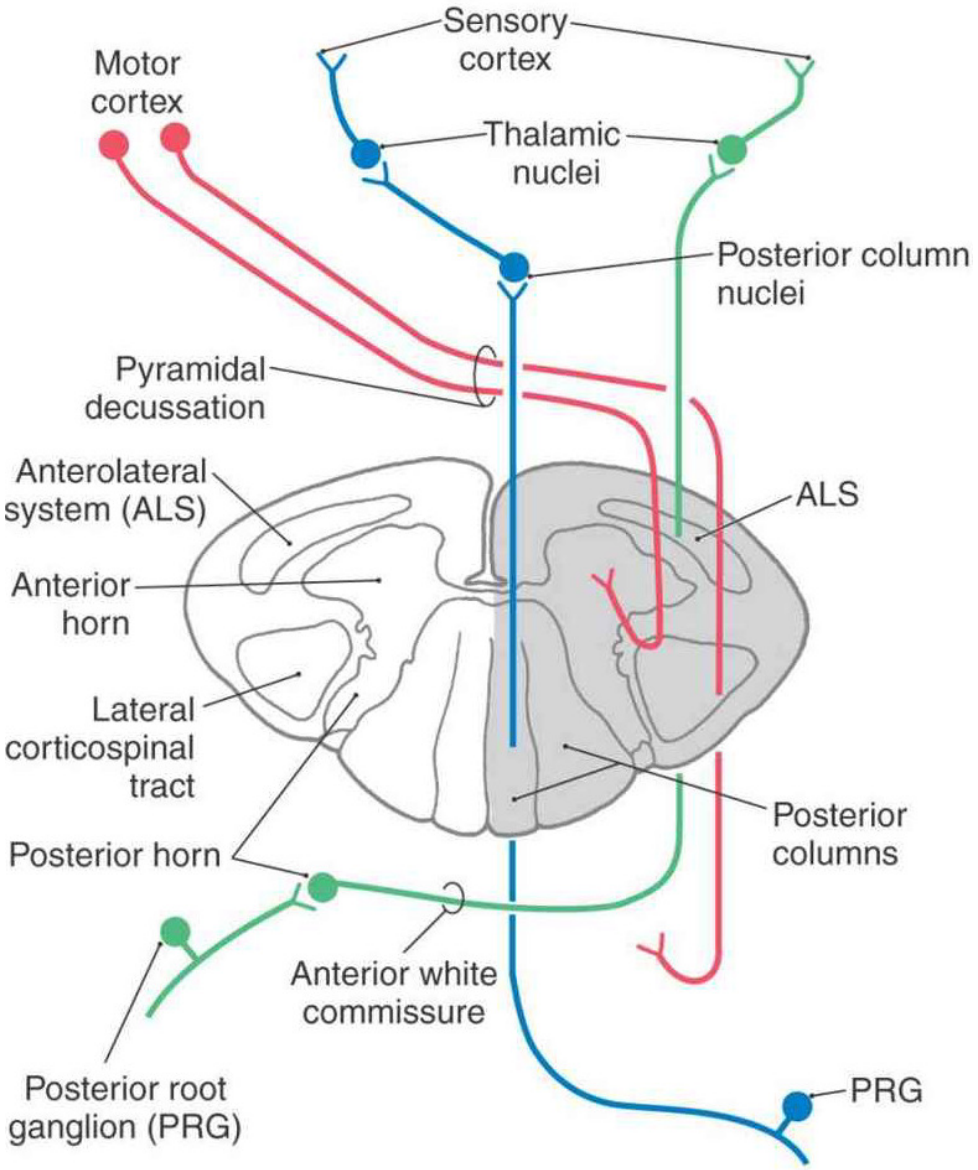
Syringomyelia

- If tit **extends into** the anterior horn results it will cause:
  - bilateral sensory loss
  - weakness of the corresponding extremity
- extension of the syrinx into one anterior horn results in an ipsilateral weakness of the upper extremity
- if both anterior horns are involved, the weakness is bilateral



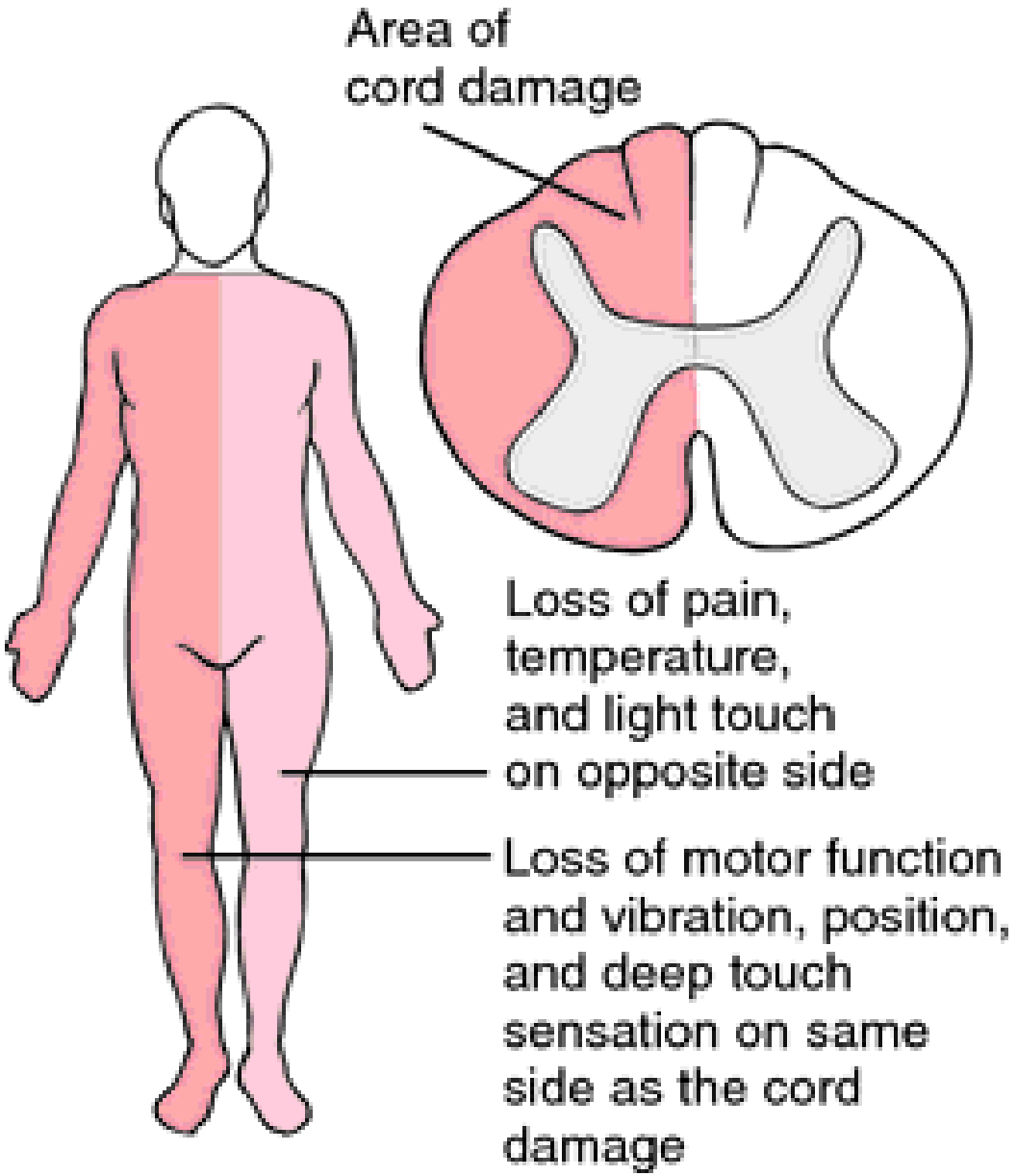
Brown-Séquard Syndrome

- Functional hemisection of the spinal cord results in:
  - damage to the lateral corticospinal tract, ALS, posterior columns
- Example: A lesion on the right at C4 to C5 will result in:
  - muscle weakness or paralysis (hemiparesis, hemiplegia) on the right side
  - loss of pain and thermal sensations on the left side
  - loss of proprioception, vibratory sense, and discriminative touch on the right



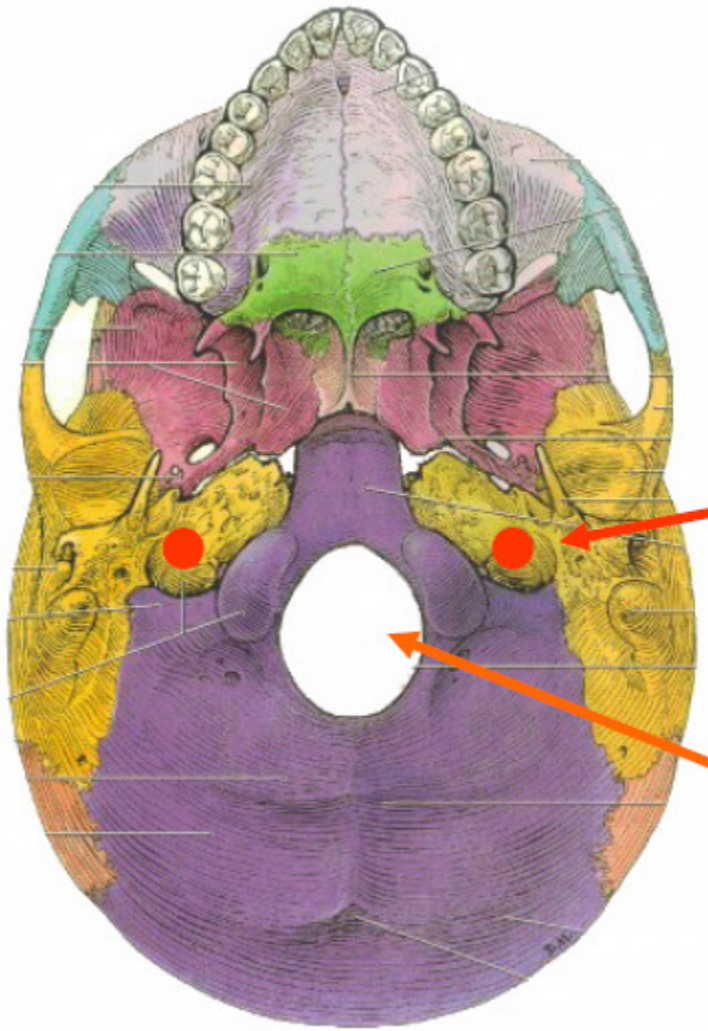
Brown-Séquard Syndrome

- **Contralateral** loss of nociceptive and thermal sensations over the body below the level of the lesion
- **Ipsilateral** loss of discriminative tactile, vibratory, and position sense over the body below the level of the lesion
- **Ipsilateral** paralysis of the leg or leg and arm, depending on the level of the hemisection



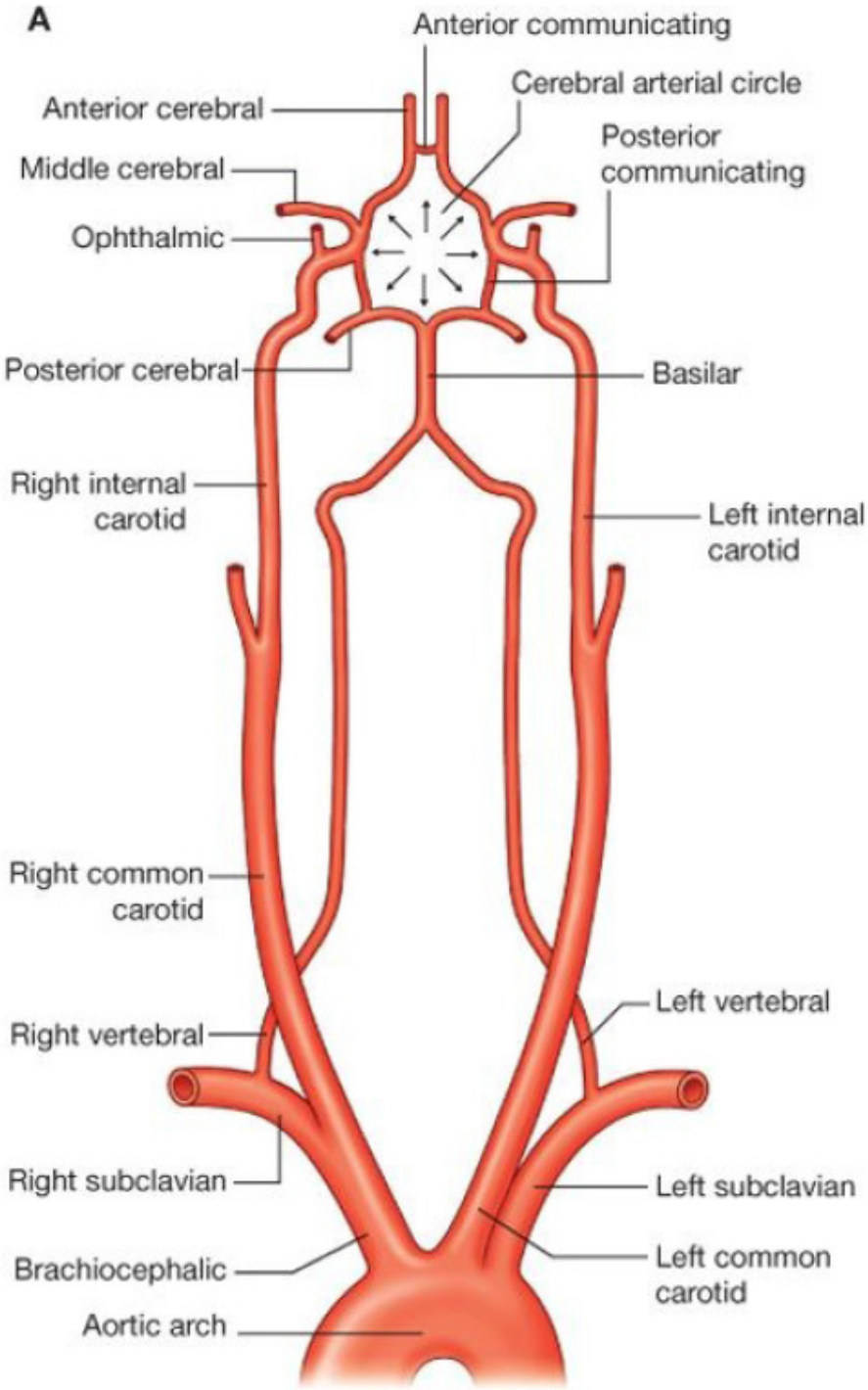
Arterial Blood Supply

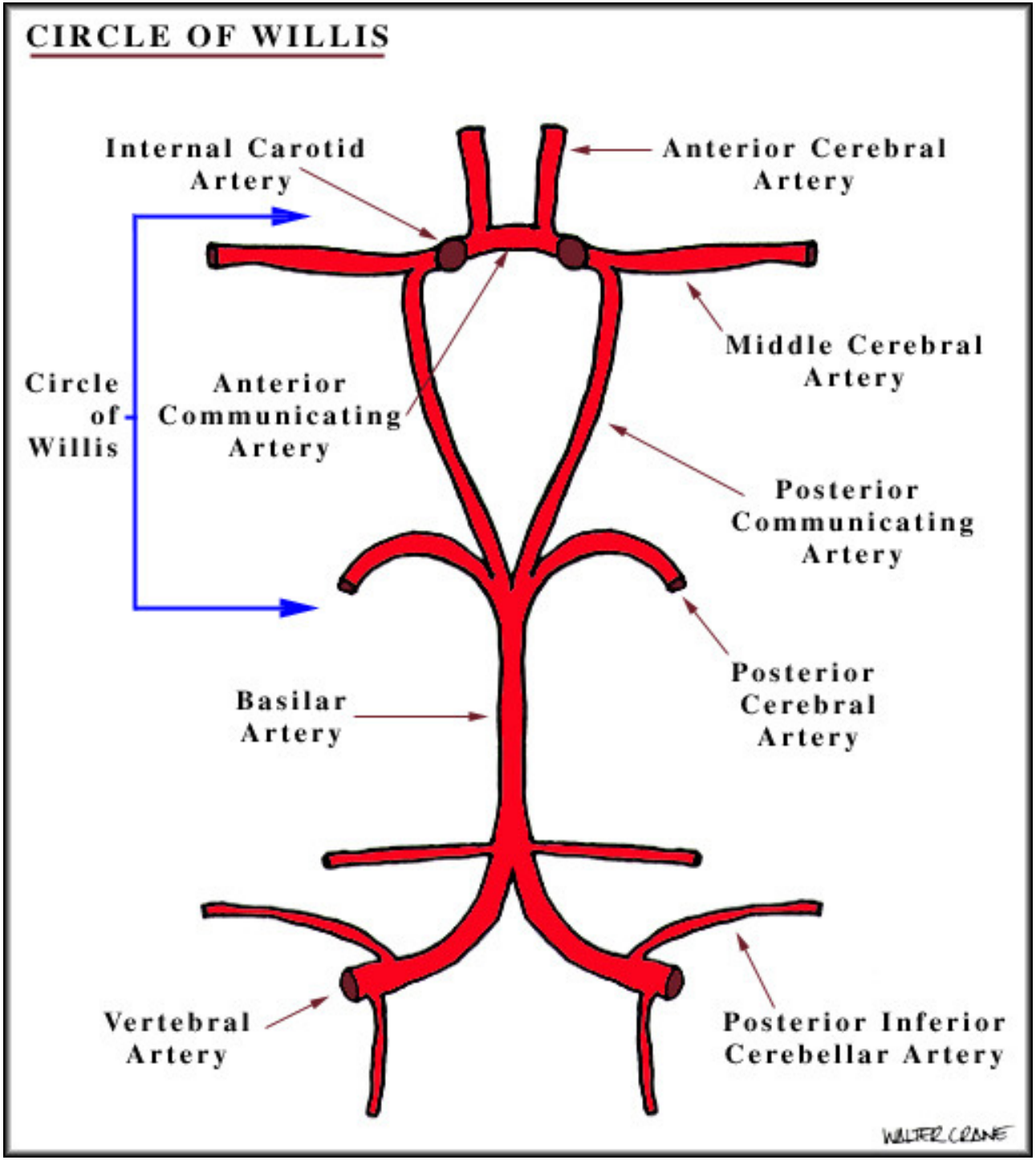
- Brain is supplied by pairs of internal carotid artery and vertebral artery.
- The four arteries lie within the subarachnoid space
- Their branches anastomose on the inferior surface of the brain to form the **circle of Willis**



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

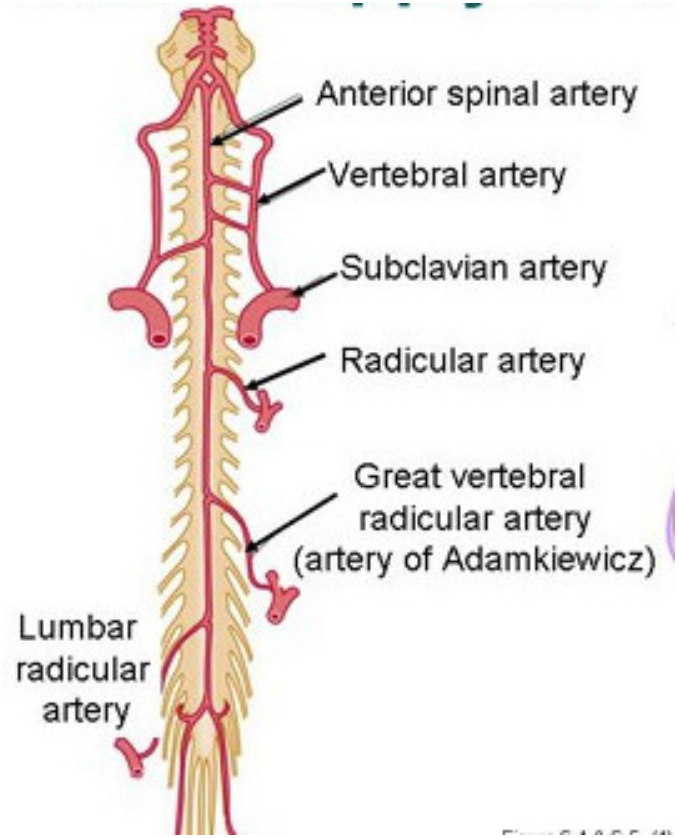
B. Vertebral artery- enters skull via Foramen Magnum

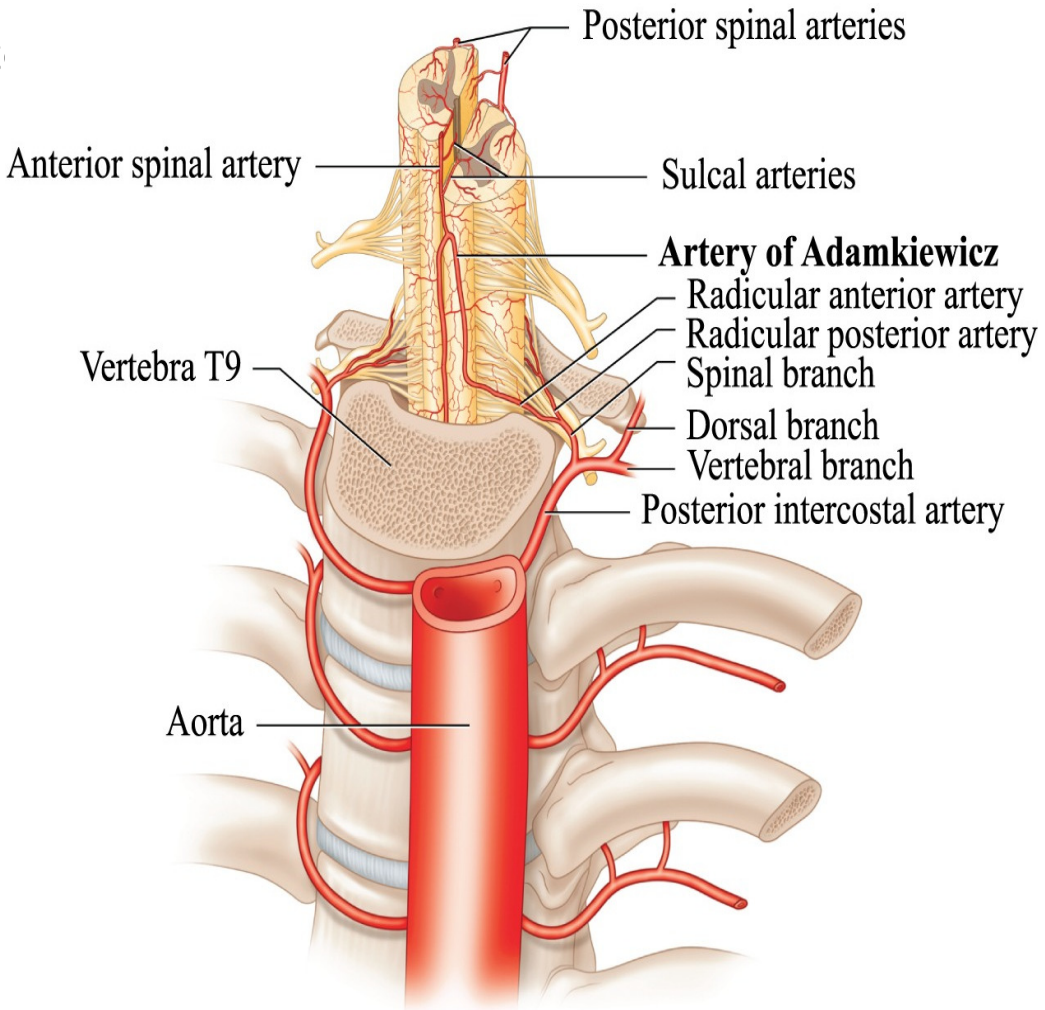

A
Anterior communicating
Cerebral arterial circle
Anterior cerebral
Posterior communicating
Middle cerebral
Ophthalmic
Posterior cerebral
Basilar
Right internal carotid
Left internal carotid
Right common carotid
Left vertebral
Right vertebral
Right subclavian
Left subclavian
Brachiocephalic
Left common carotid
Aortic arch


CIRCLE OF WILLIS
Internal Carotid Artery
Anterior Cerebral Artery
Middle Cerebral Artery
Circle of Willis
Anterior Communicating Artery
Posterior Communicating Artery
Posterior Cerebral Artery
Basilar Artery
Vertebral Artery
Posterior Inferior Cerebellar Artery
WALTER CRANE

Blood supply of spinal c

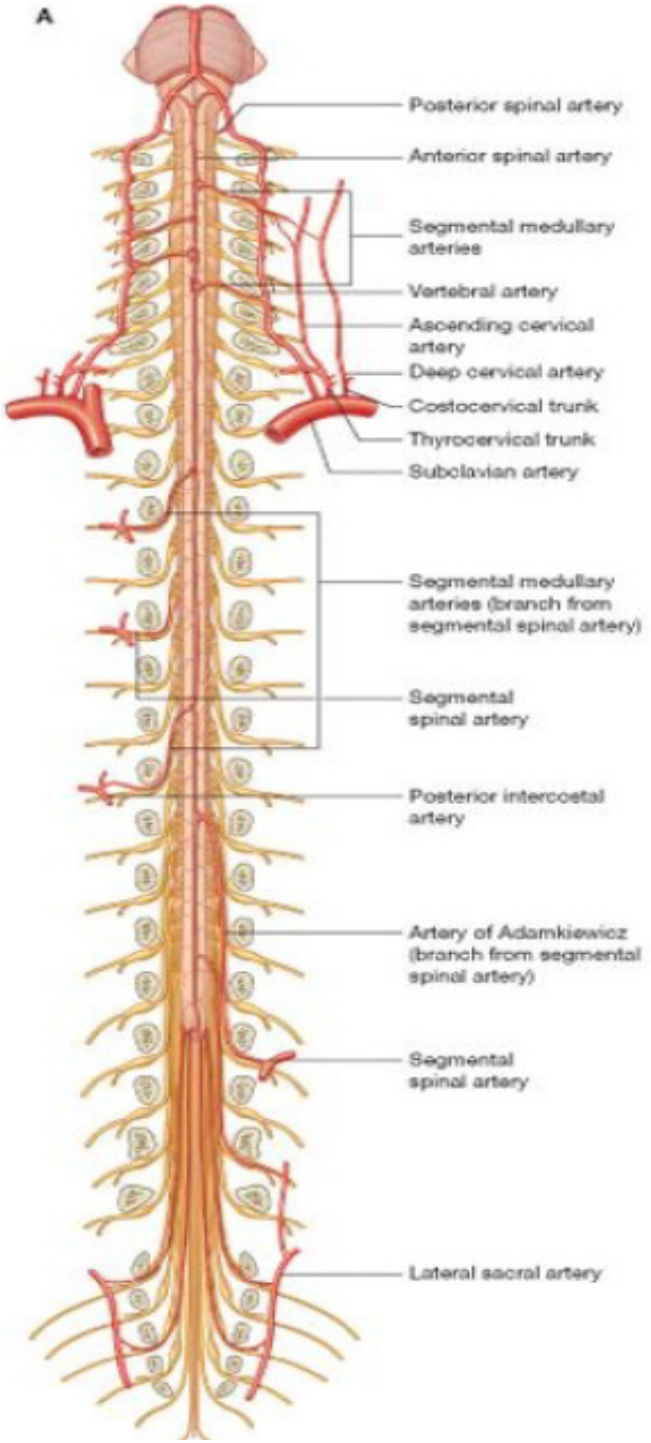
- **Longitudinal arteries:**
  - **One anterior spinal artery**: arise from the vertebral arteries (in anterior median fissure)
  - **Two posterior spinal arteries**: arise from the posterior inferior cerebellar artery (in the posterolateral sulcus)





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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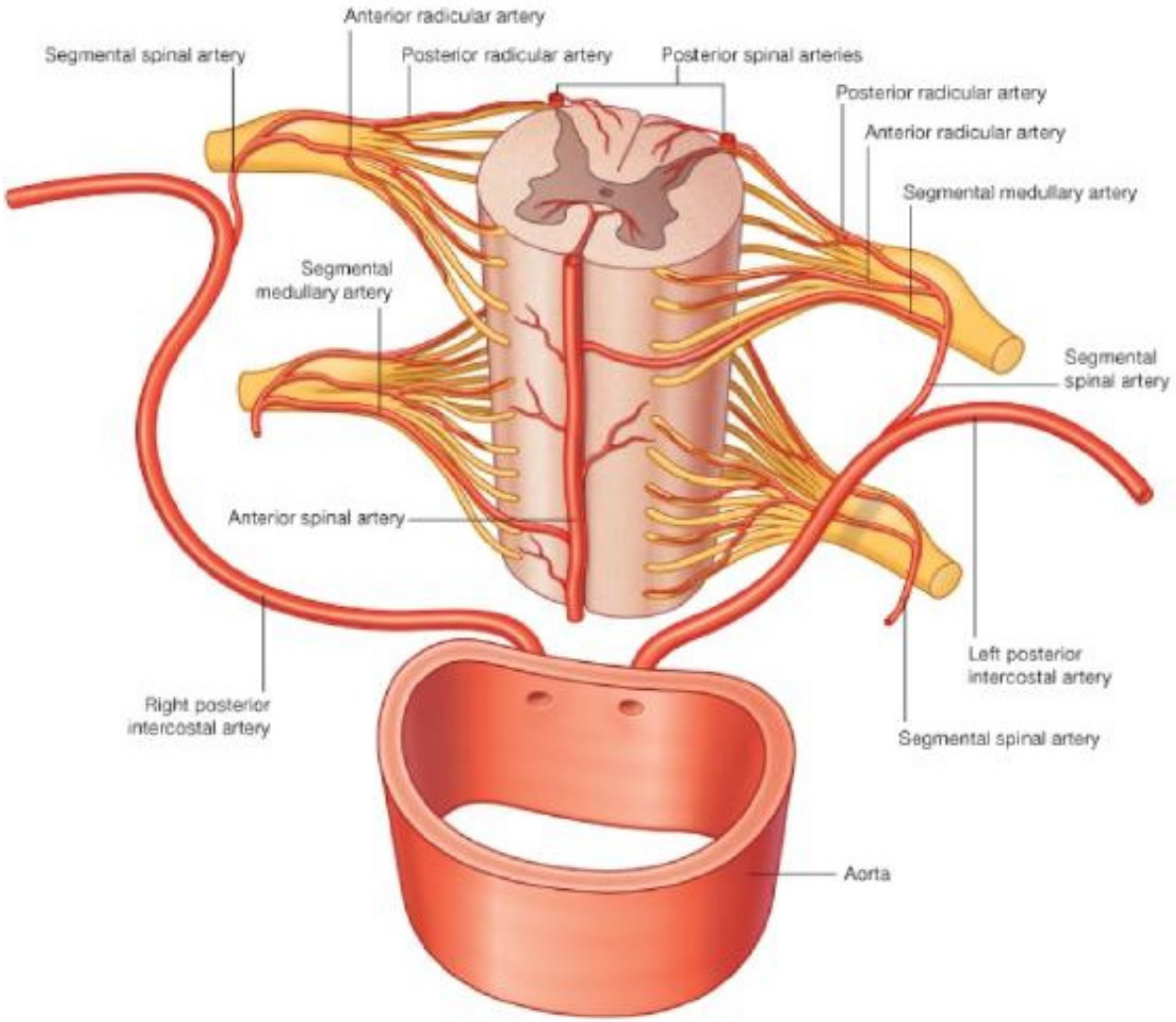
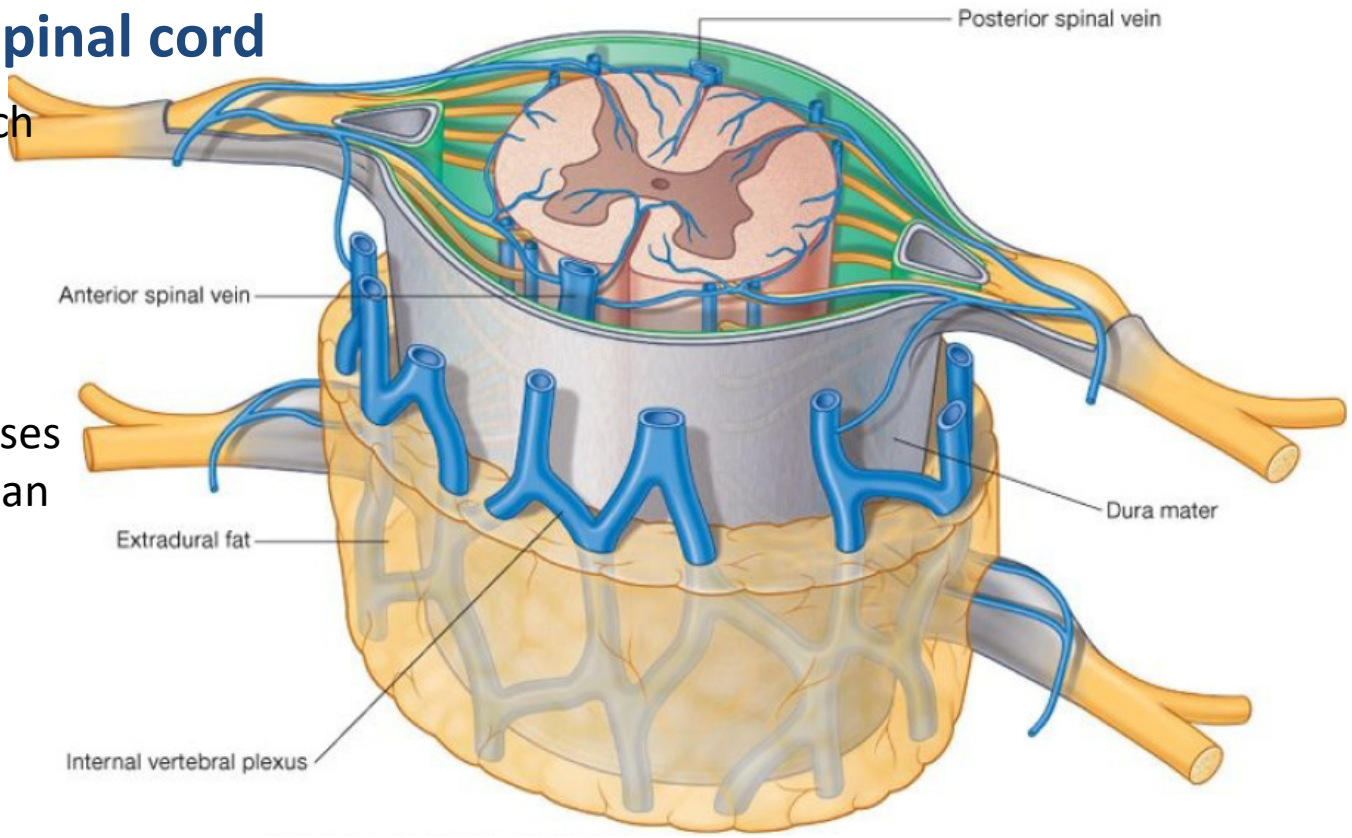


Venous drainage of spinal cord

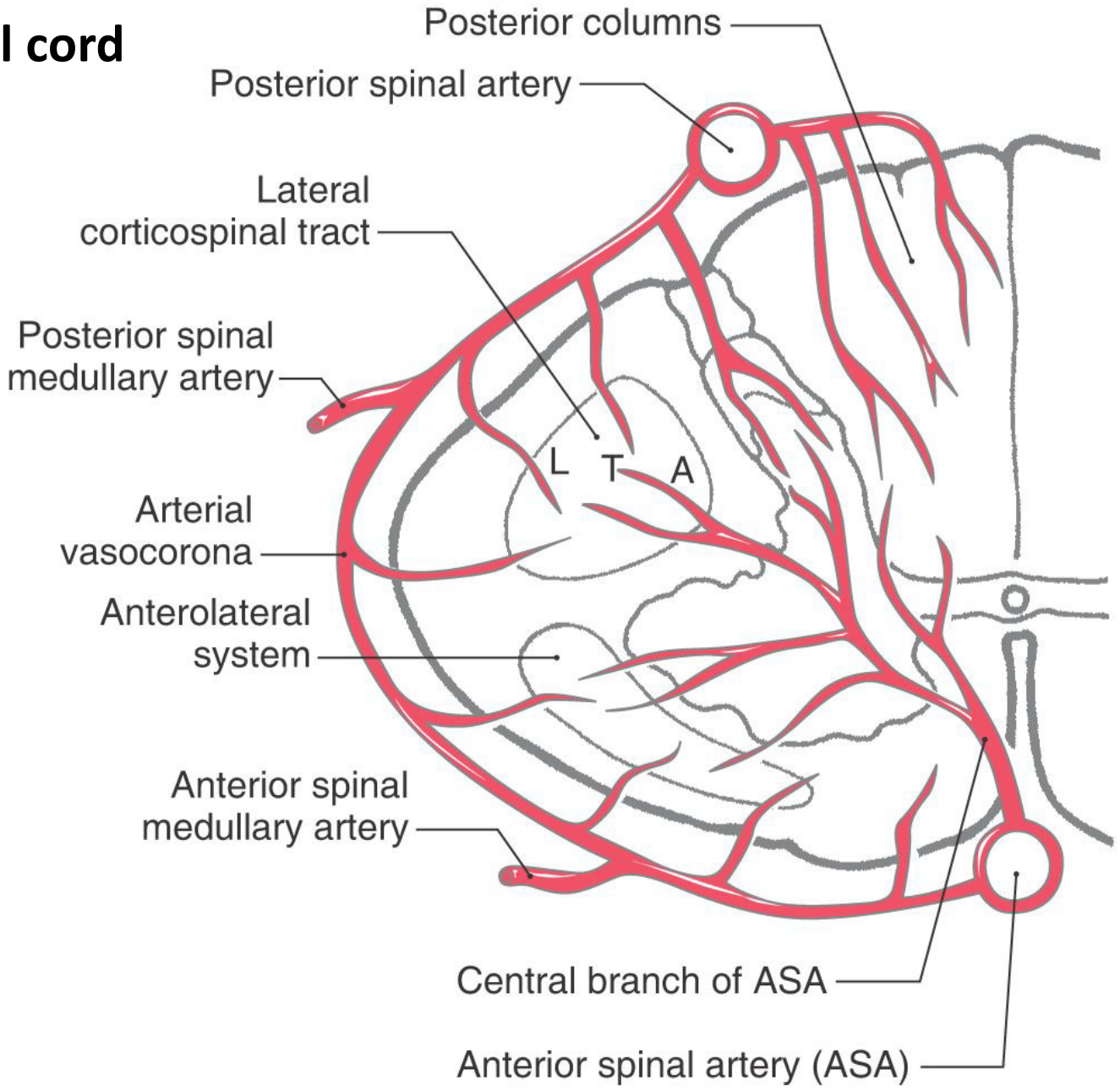
- Two pairs of veins on each side
- One midline channel parallels the anterior median fissure
- One midline channel passes along the posterior median sulcus



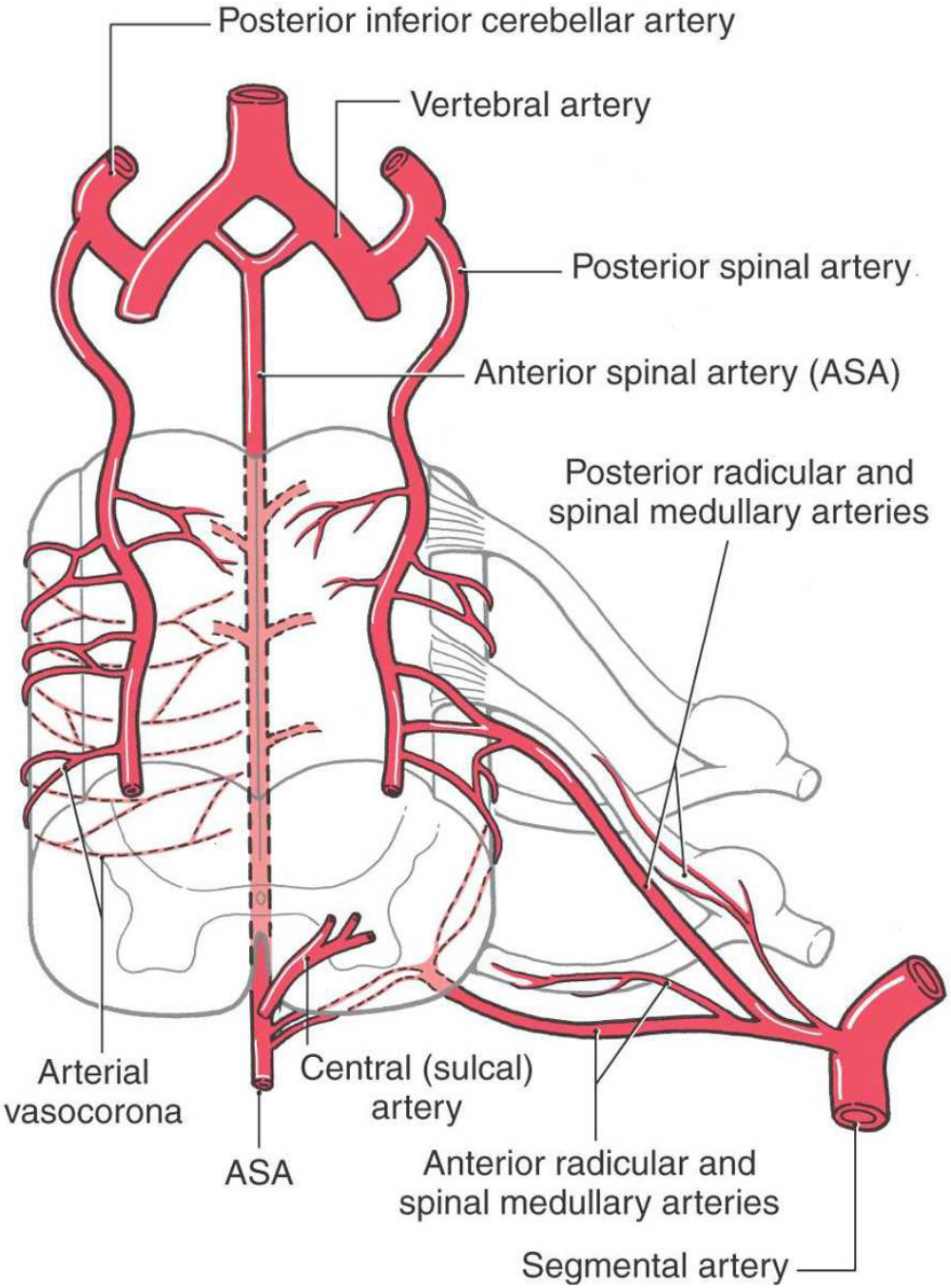
- Drain into an extensive internal vertebral plexus in the extradural (epidural) space of the vertebral canal
- Then drains into segmentally arranged vessels that connect with major systemic veins
  - Azygos system in the thorax.
  - The internal vertebral plexus
  - Intracranial veins

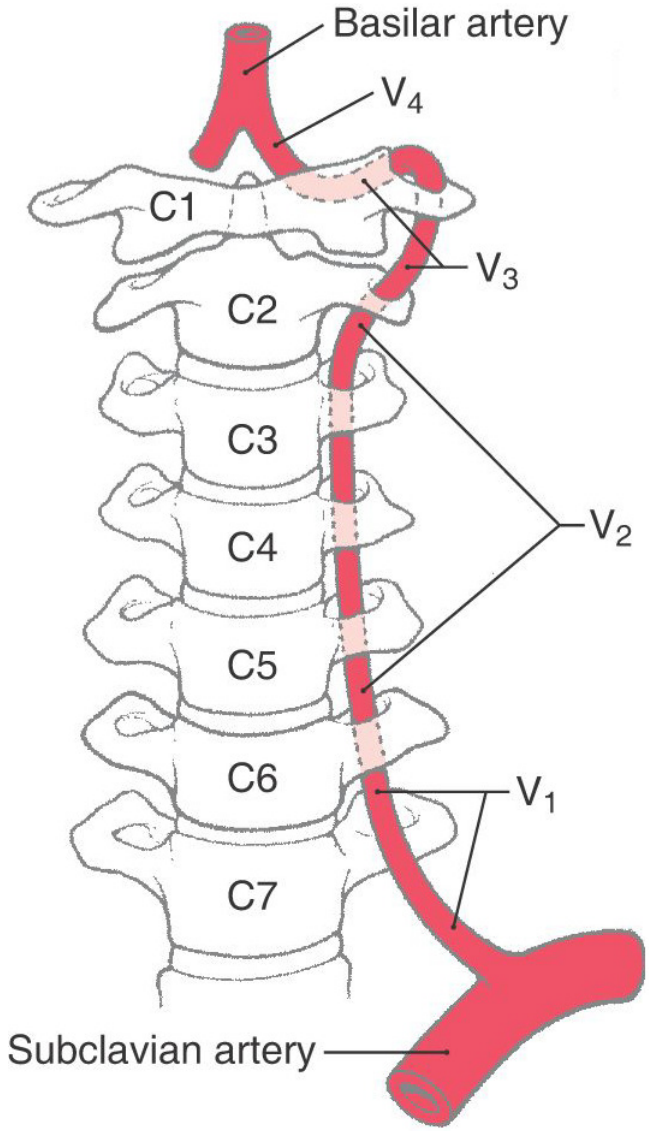
Blood supply of spinal cord

- 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



Blood supply of spinal cord





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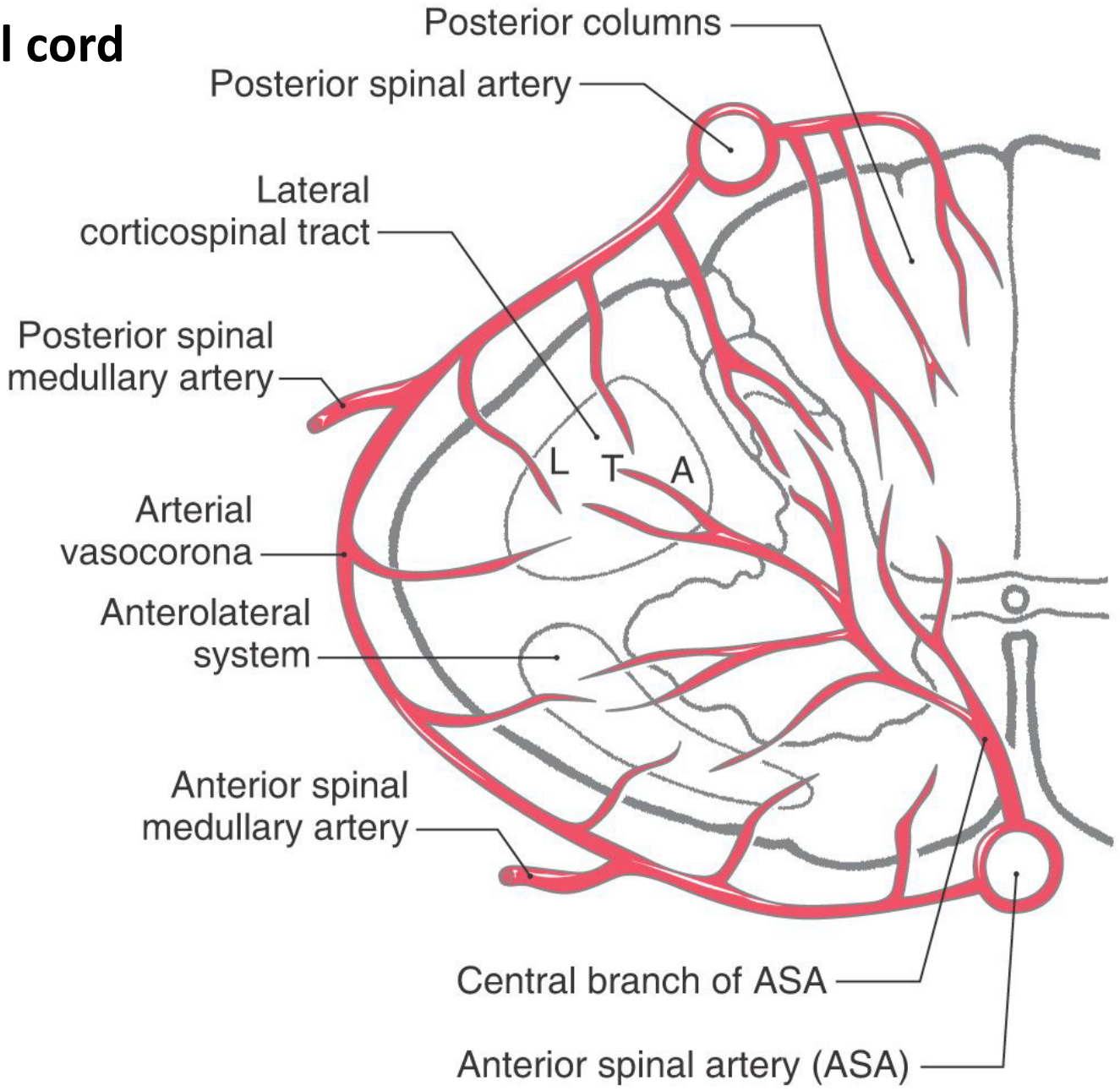
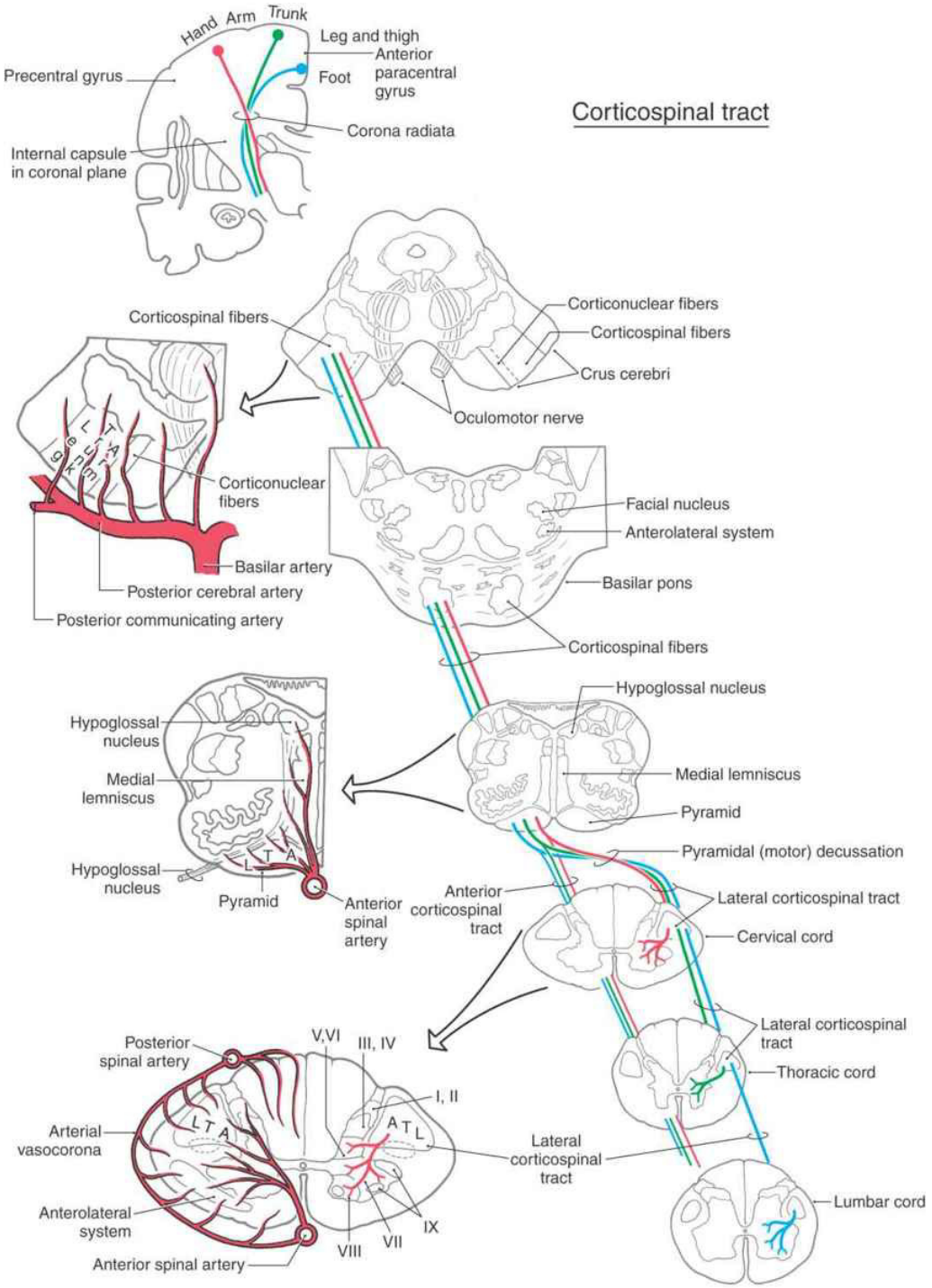


Central Cord Syndrome

- may result from hyperextension of the neck
- Occludes blood supply to the cord via the anterior spinal artery
- bilateral weakness of the extremities (more so of the upper than of the lower)
- pain and thermal sensation loss, and bladder dysfunction



- Compromise of blood flow in the **posterior spinal artery** results in:
- **Ipsilateral reduction or loss of discriminative, positional, and vibratory tactile sensations at and below the segmental level of the injury**