Descending tracts

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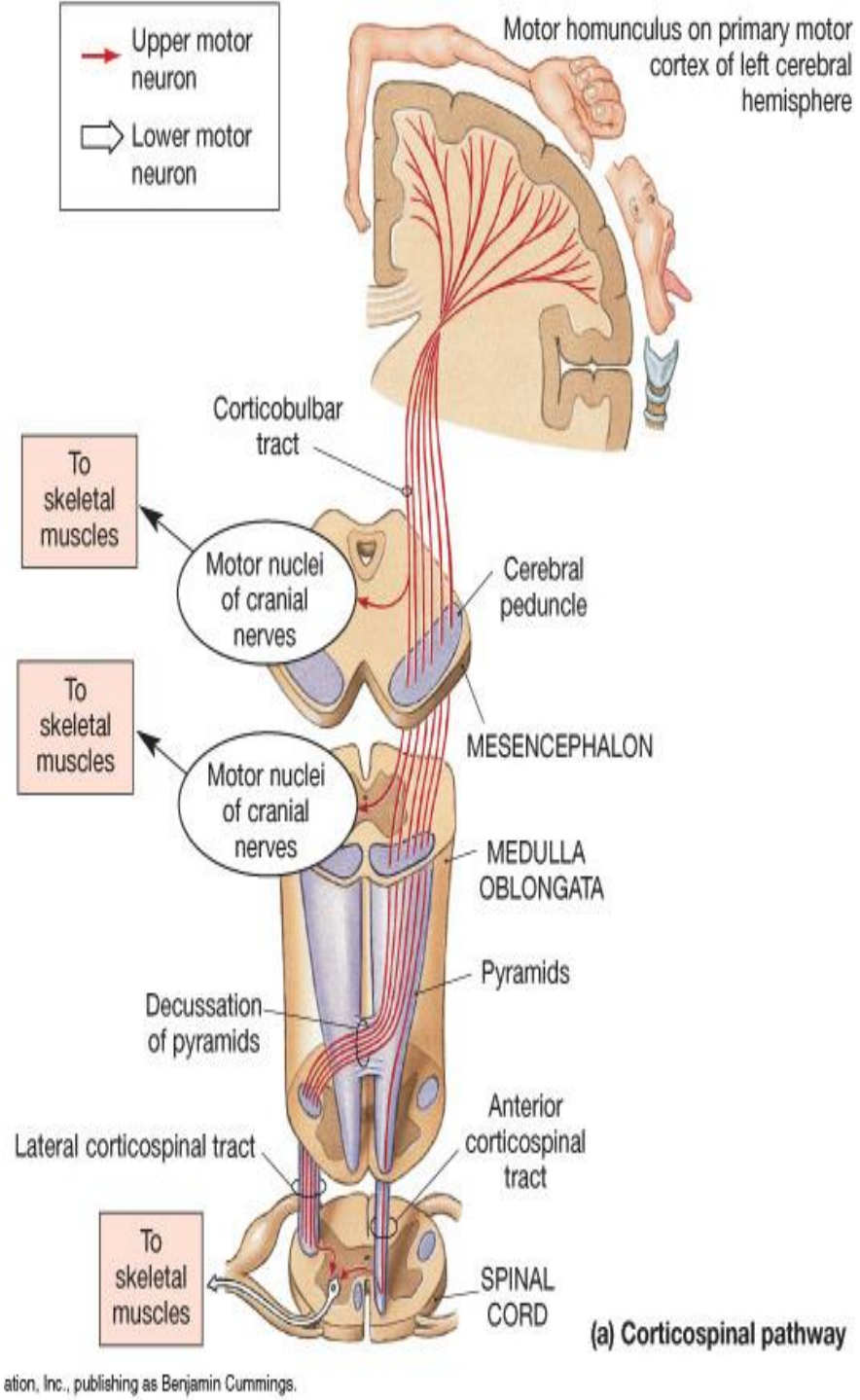
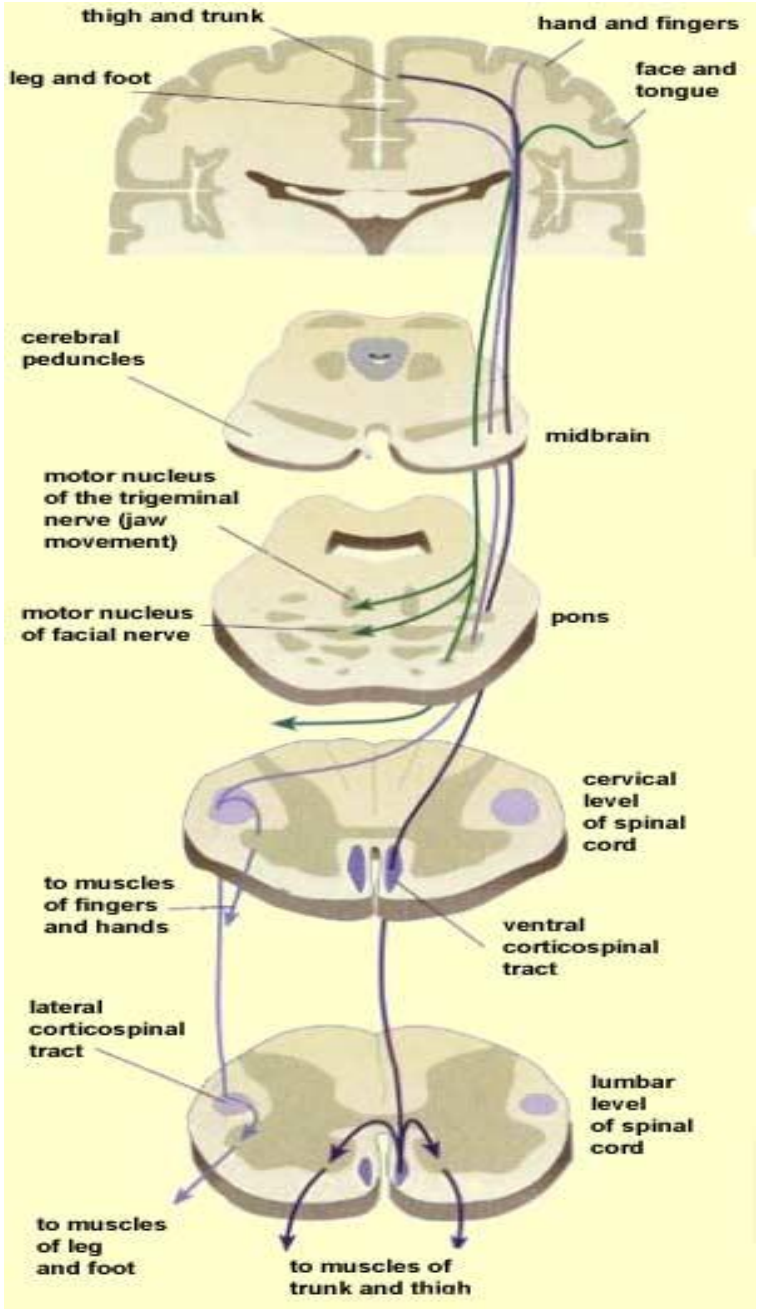
Descending Tracts

Pyramidal tract

- **Origin :** neurons of motor and premotor area
- Axons converge in corona radiata
- Pass in anterior 2/3 of posterior limb of internal capsule
- Descends in middle 3/5 of crus of mid brain
- Descend as scattered bundles in pons
- Fibers collect to form pyramid of medulla
- 80% of fibers cross in lower most part of medulla& descend as lateral corticospinal tract in lateral white column
- 20% are uncrossed and descend as anterior corticospinal(usually they cross at lower level)




thigh and trunk
hand and fingers
leg and foot
face and tongue
cerebral peduncles
midbrain
motor nucleus of the trigeminal nerve (jaw movement)
motor nucleus of facial nerve
pons
cervical level of spinal cord
to muscles of fingers and hands
ventral corticospinal tract
lateral corticospinal tract
lumbar level of spinal cord
to muscles of leg and foot
to muscles of trunk and thigh

Lamination, Termination of pyramidal tract

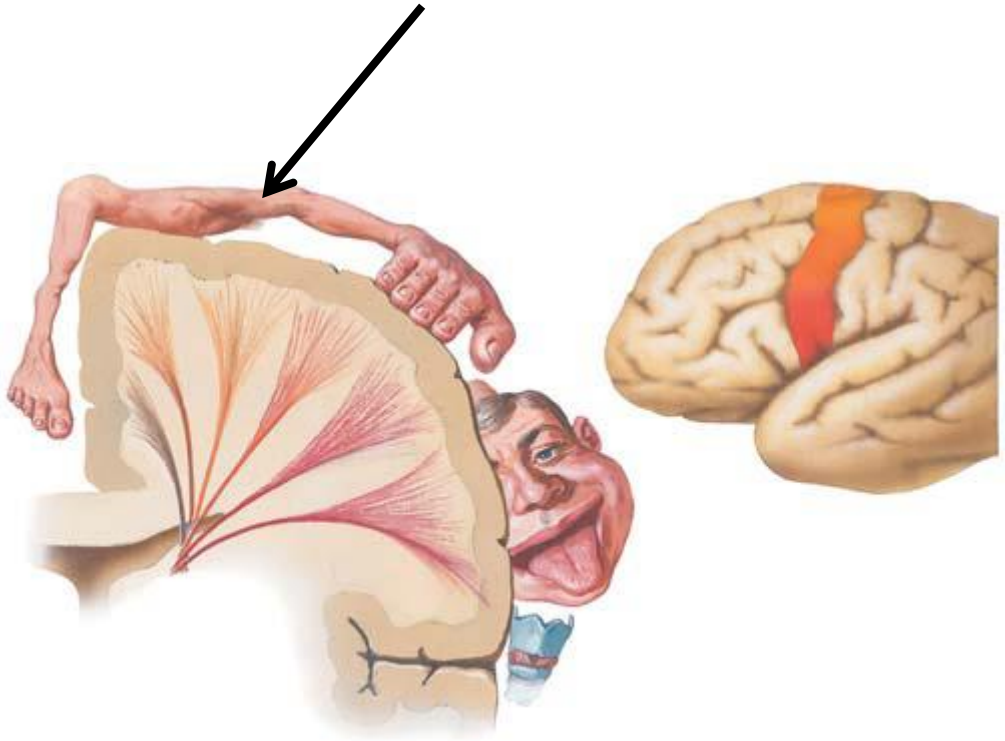
Lamination:

- in cerebral cortex body is presented up side down
- In internal capsule: upper limb anterior, lower limb posterior .
- In brainstem and spinal cord: cervical are medial and sacral are lateral

Termination:

- 1-crossed fibers end on lateral group of anterior horn cells to supply limbs
- 2- uncrossed fibers end on medial group of anterior horn cells of both sides supplying trunk

In cerebral hemisphere body is presented upside down



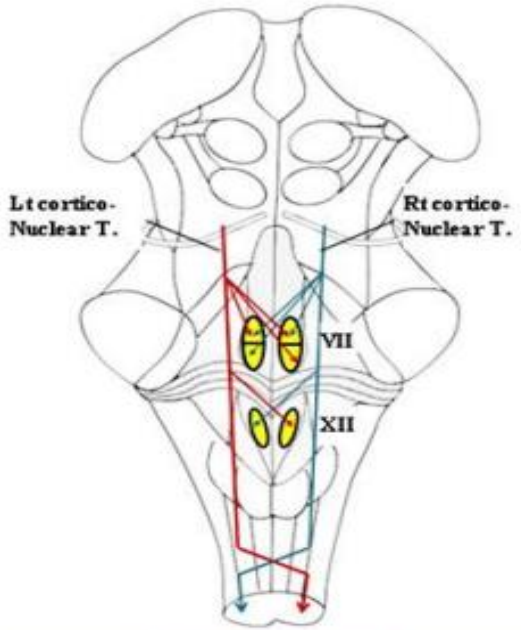
Cortico bulbar

- Some pyramidal fibers end on motor nuclei of cranial nerves present in brain stem
- All cranial nerve nuclei receive bilateral corticobulbar except

➢ Facial nucleus that supplies muscle of lower part of face

➢ Hypoglossal nucleus that supplies genioglossus

Both receive contra lateral supply only

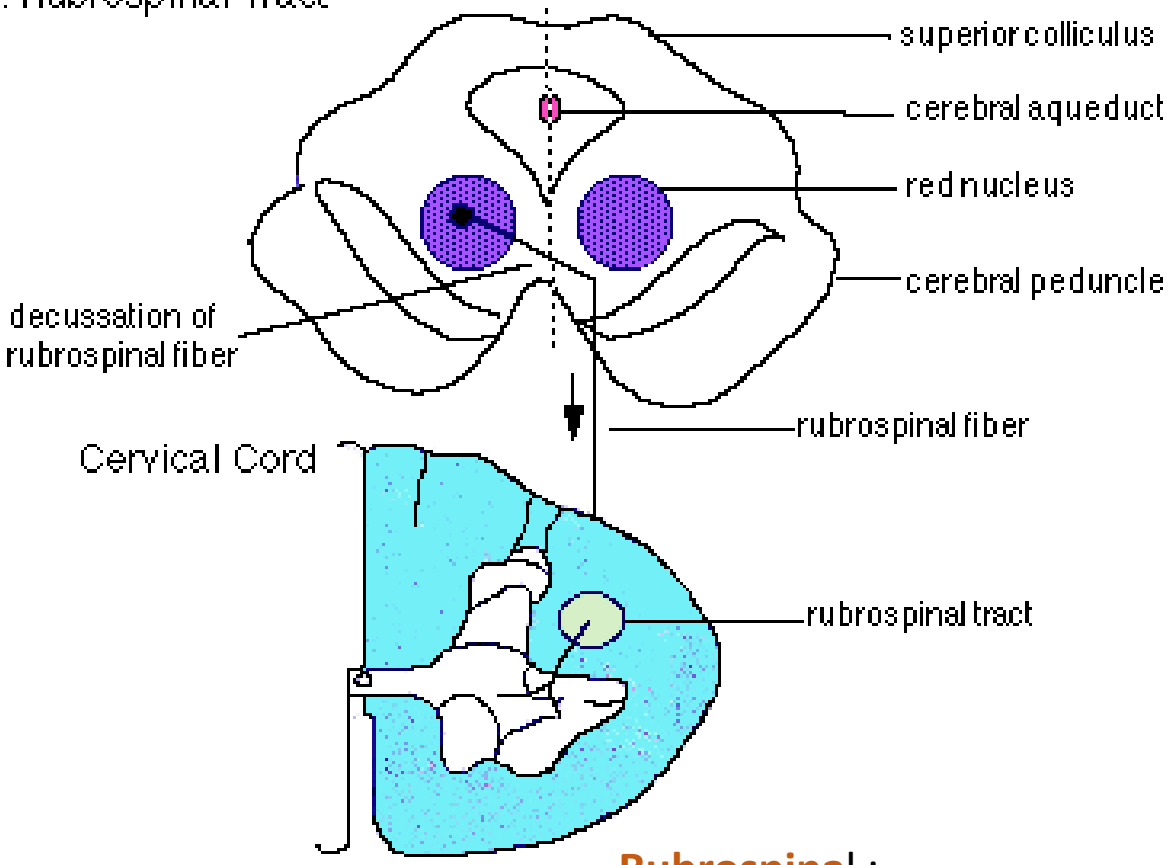


Extra- Pyramidal Tracts

- These are descending tracts, apart from the pyramidal tract, that influence the AHCs.
- These tracts are named according to their starting point.
- They are formed of either crossed, uncrossed, or a combination.
- They may be excitatory or inhibitory to muscles.
- They are responsible for adjusting muscle tone, posture and the semiautomatic movements such as swinging the arm during walking. On the other hand the pyramidal tract is responsible for skilled voluntary movements in the distal parts of the limbs.

- Rubrospinal
- Tectospinal
- Medial vestibulospinal
- Lateral vestibulospinal
- Medial reticulospinal
- Lateral reticulospinal

1. Rubrospinal Tract

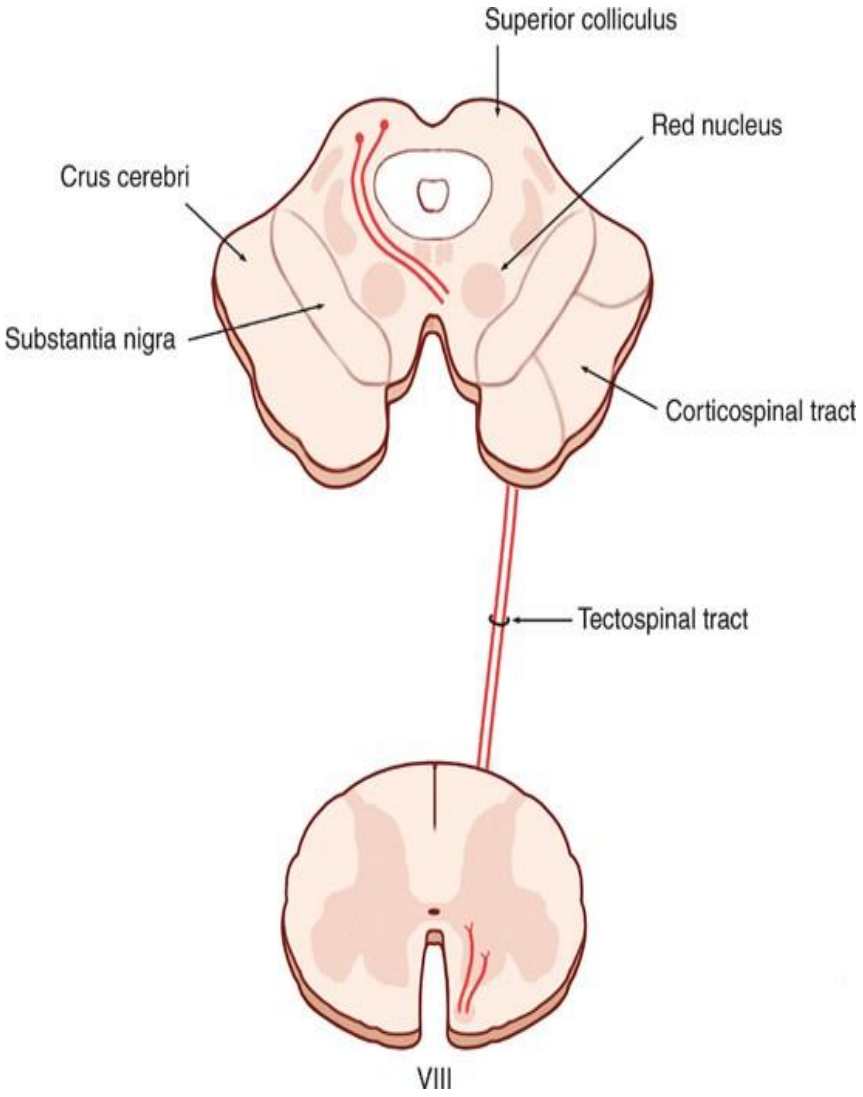


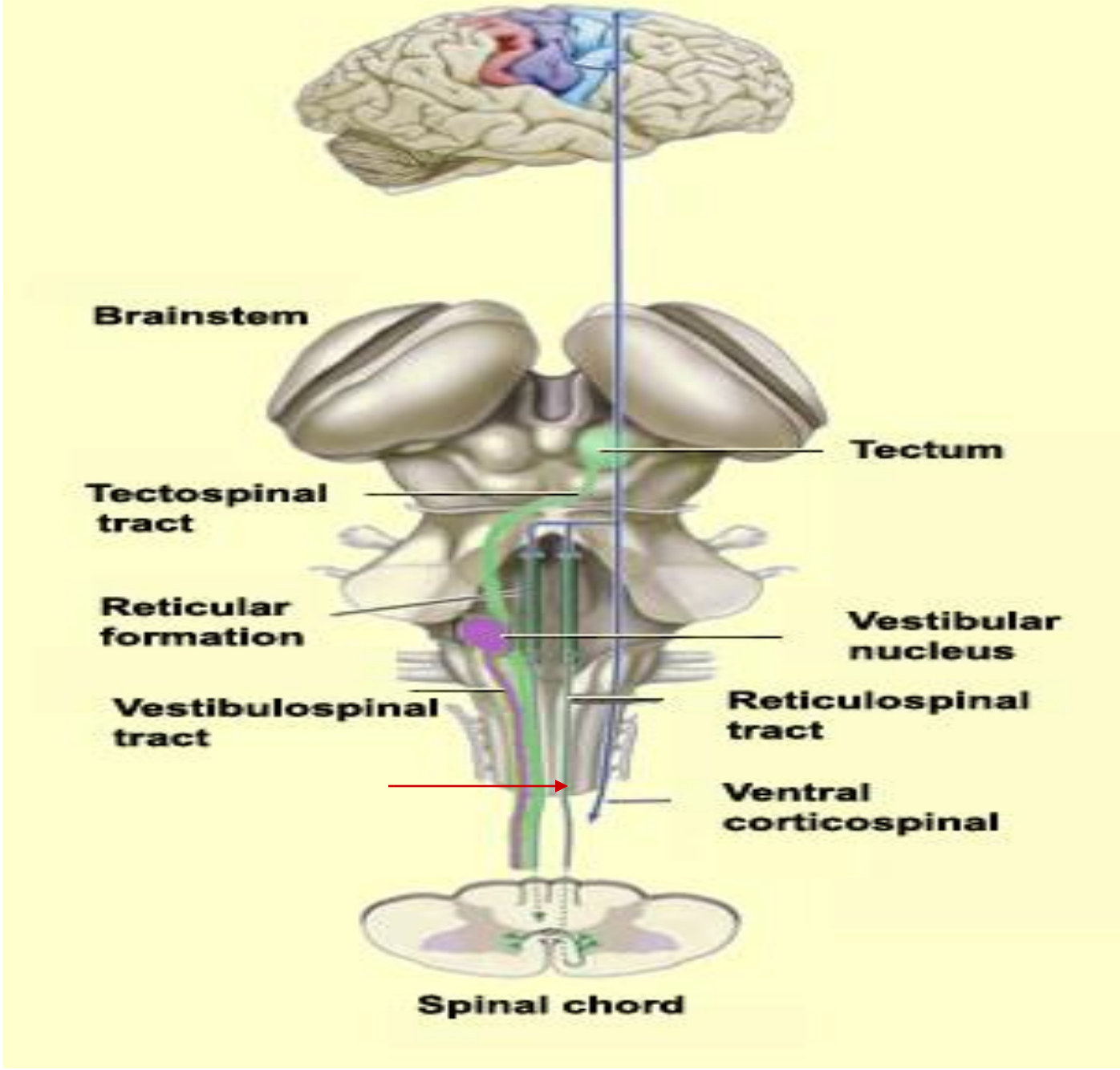
Rubrospinal :

- Origin : red nucleus
- Decussate in ventral decussation in the mid brain
- Lies in lateral white column of cervical segment
- Lateral group of cervical anterior horn cells
- Facilitate flexors of upper limb

Tecto spinal tracts

- Origin: superior colliculus
- Cross in dorsal decussation in the mid brain
- End in medial group of cervical of anterior horn cells
- Turning of head and neck in response to auditory and visual & cutaneous




Brainstem
Tectum
Tectospinal tract
Reticular formation
Vestibular nucleus
Vestibulospinal tract
Reticulospinal tract
Ventral corticospinal
Spinal chord

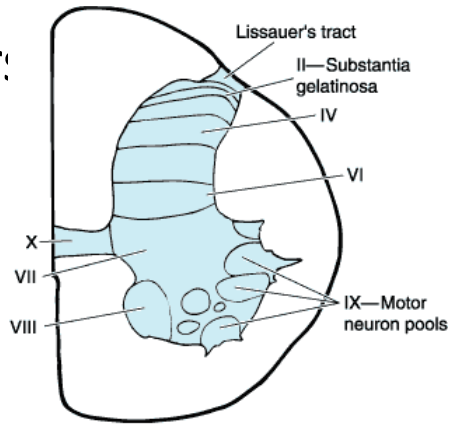
Reticulo-spinal tracts

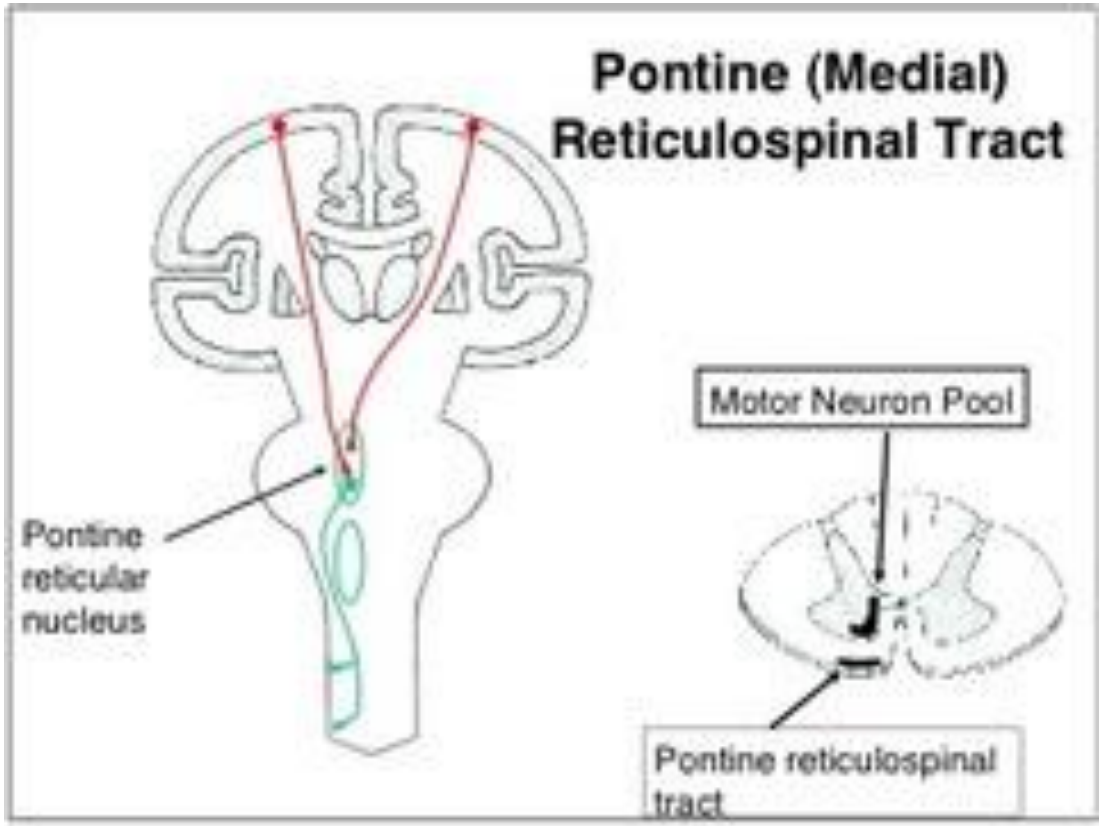
Medial reticulo-spinal

- Pontine reticular formation
- Uncrossed
- Anterior column
- Gamma motor neuron of lamina IX
- Facilitate extensors

Lateral reticulo-spinal

- Medullary reticular format
- Crossed
- Lateral column
- Gamma motor neuron of lamina IX
- Inhibit extensor




Pontine (Medial)
Reticulospinal Tract
Pontine
reticular
nucleus
Motor Neuron Pool
Pontine reticulospinal
tract

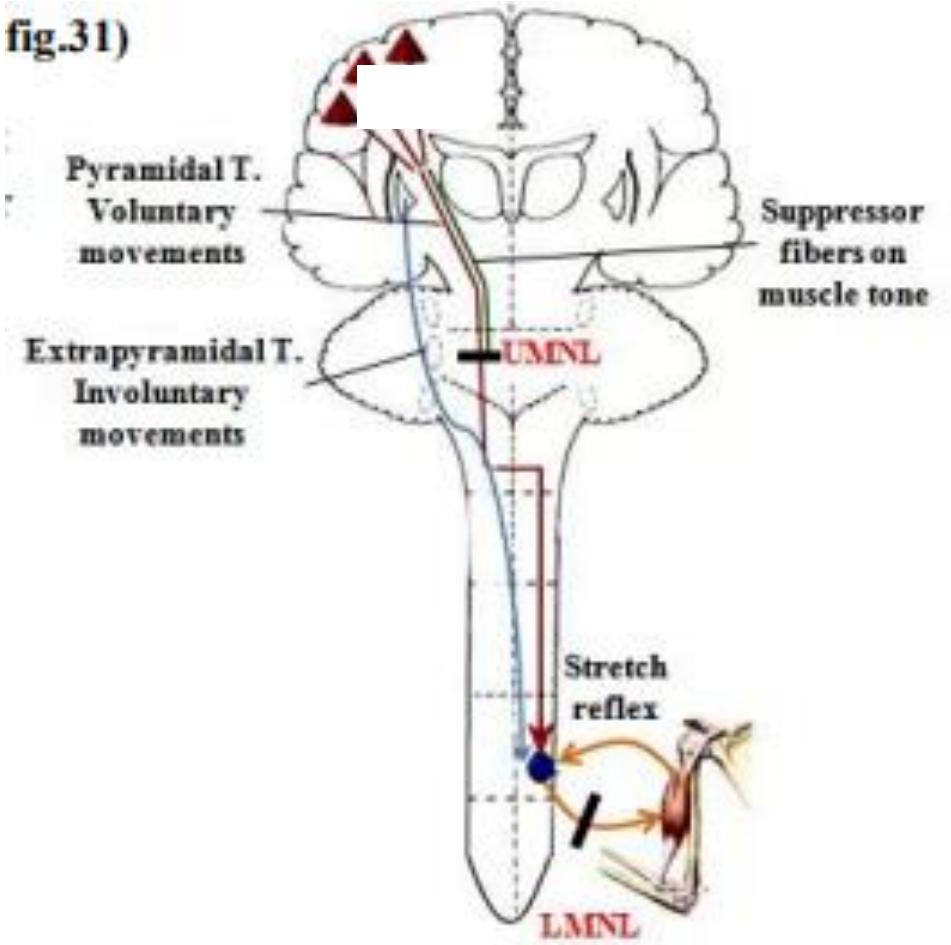
Vestibulo-spinal tracts

Medial vestibulospinal

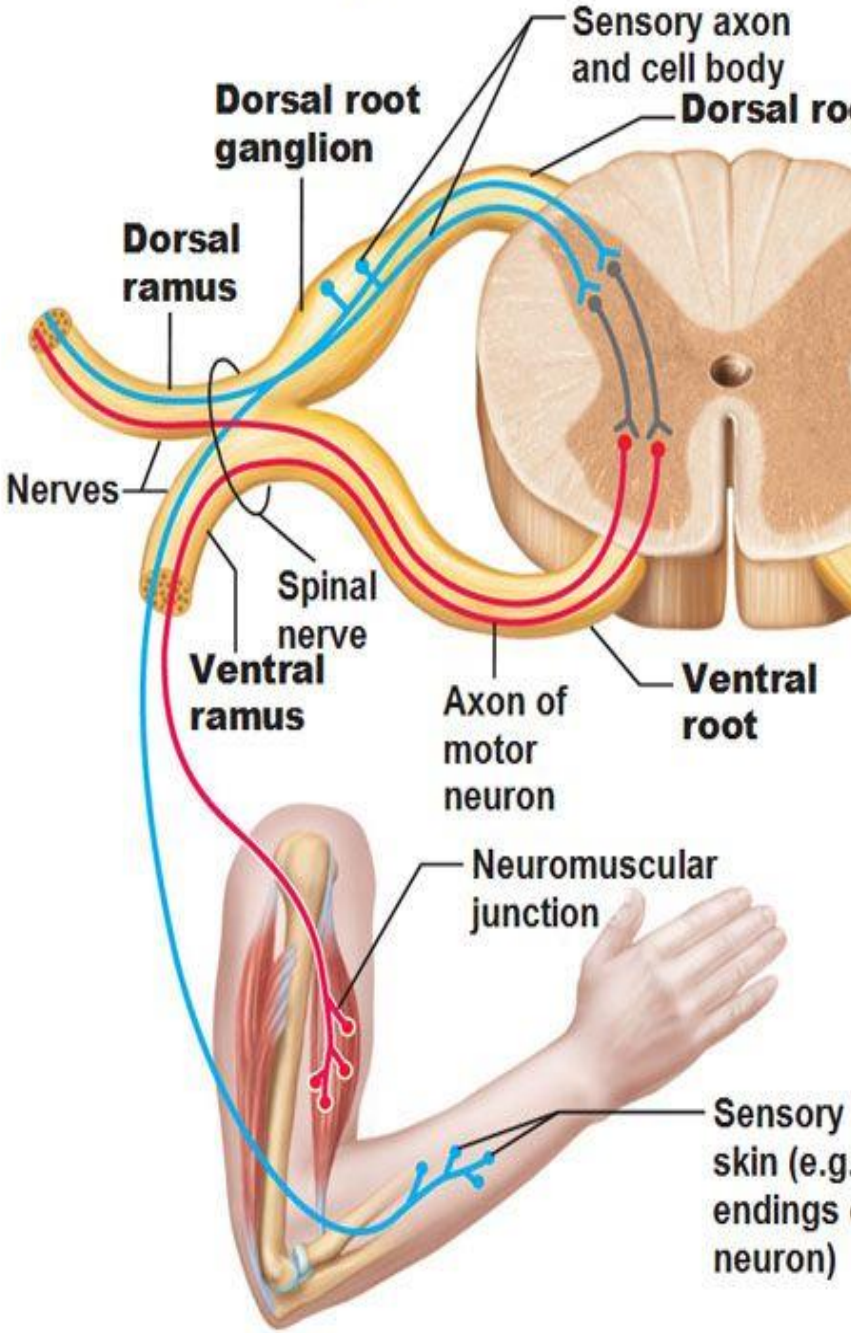
- Arise from medial vestibular
- Doesn't cross to the oppsite side
- Anterior column to T3
- Alpha and gamma neurons of extensors
- Keep head and vision horizontal when body is tilted

- **Lateral vestibule**
- Lateral vestibular nucleus
- Doesn't cross to the oppsite side
- Anterior column whole length
- Alpha and gamma neurons of extensors
- Adjust body posture in response to cerebellar impulse

fig.31)



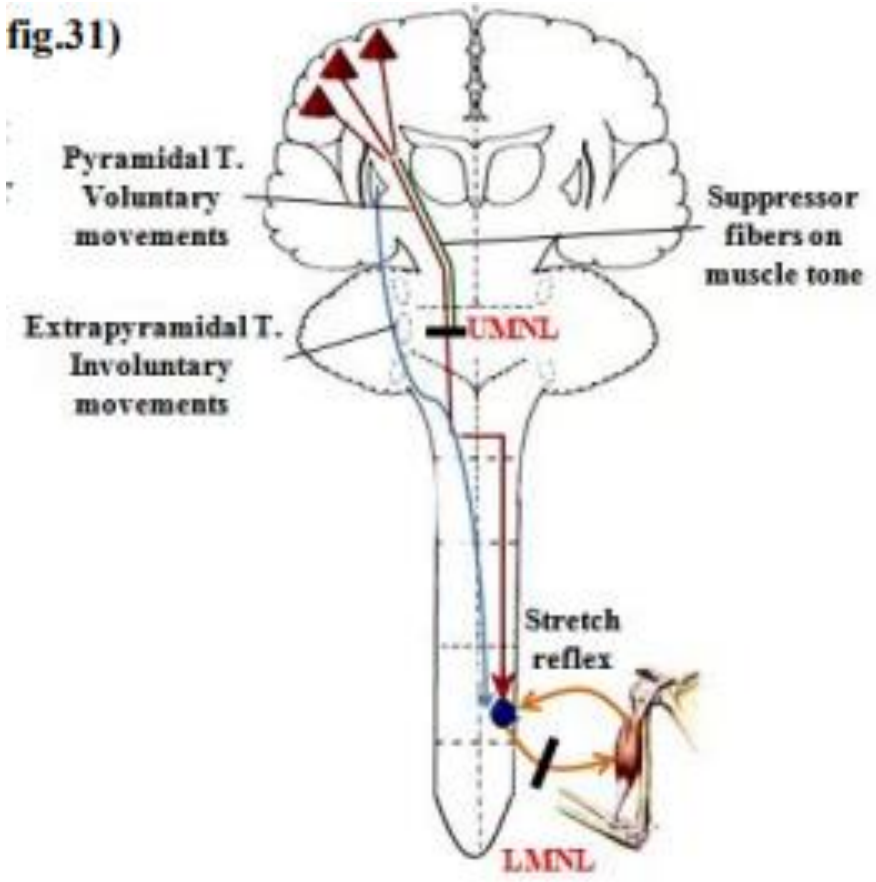
Spinal Nerves



Upper & Lower Motor Neuron Lesions

The upper motor neuron :Neurons from the cerebral cortex that descend to end on the AHCs or motor nuclei of cranial nerves form.

lower motor neuron: Neurons of AHCs or motor cranial nerves nuclei form



	Upper Motor Neuron Lesion [UMNL]	Lower Motor Neuron Lesion [LMNL]
Means	Lesion of the pyramidal tract e.g. capsular hemiplegia.	Lesion of AHCs or motor cranial nuclei e.g. poliomyelitis.
Movements	Only voluntary movements are lost while the involuntary & emotional movements are intact i.e. it is Paralysis of movement	All movements are lost & the muscle cannot be moved by any means i.e. it is Paralysis of muscle
Muscle tone	Clasp knife spasticity occurs due to interruption of inhibitory fibers (from area 4 S) which suppress the stretch reflex arc	Hypotonia [flaccidity] occurs due to Interruption of the stretch reflex arc
Tendon jerks	Exaggerated & clonus may occur.	Lost.
Superficial reflexes	Abdominal & cremasteric reflexes are absent	Usually not affected
Plantar response	Extensor response [+ve Babinski sign] = scratching the lateral side of foot causes dorsiflexion of big toe & fanning of outer toes (	Lost N.B: the normal plantar response is flexion of all the toes
Atrophy	Does not occur	Disuse atrophy occurs

Arterial Supply of Spinal Cord

- The spinal cord is supplied by three sets of arteries: two longitudinal (anterior & posterior spinal arteries) and many segmental radicular arteries.

1. Anterior Spinal Artery

Origin: a single artery formed by union of two anterior spinal arteries, each is a branch of the vertebral artery inside the skull.

Course: It descends through the foramen magnum then runs in the anterior median fissure of the spinal cord.

Distribution: It supplies the medial part of medulla oblongata and the anterior 2/3 of the cross-sectional area of the spinal cord i.e. anterior & lateral white columns & ventral horn, lateral horn & base of dorsal horn.

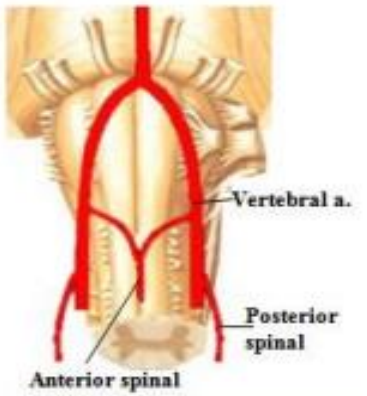


Figure 35: spinal arteries

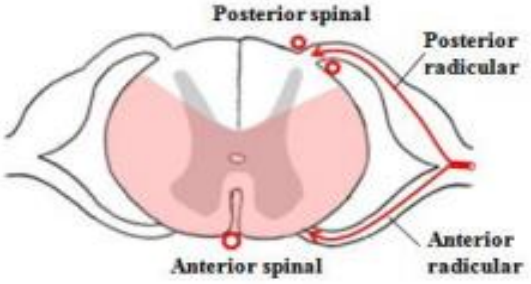


Figure 36: blood supply of spinal cord

2. Posterior Spinal Arteries

Origin: Each posterior spinal artery arises from the vertebral artery or more commonly from its posterior inferior cerebellar branch.

Course: It descends through the foramen magnum then along the postero-lateral sulcus dividing into two branches, one descends anterior & the other posterior to the dorsal roots of the spinal nerves.

Distribution: It supplies the posterior 1/3 of the spinal cord i.e. posterior white column & posterior horn

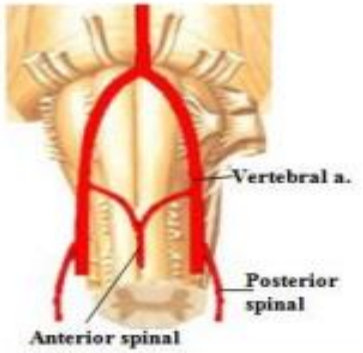


Figure 35: spinal arteries

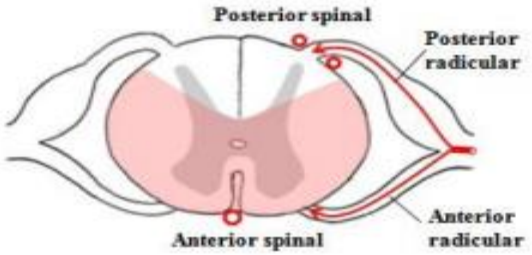
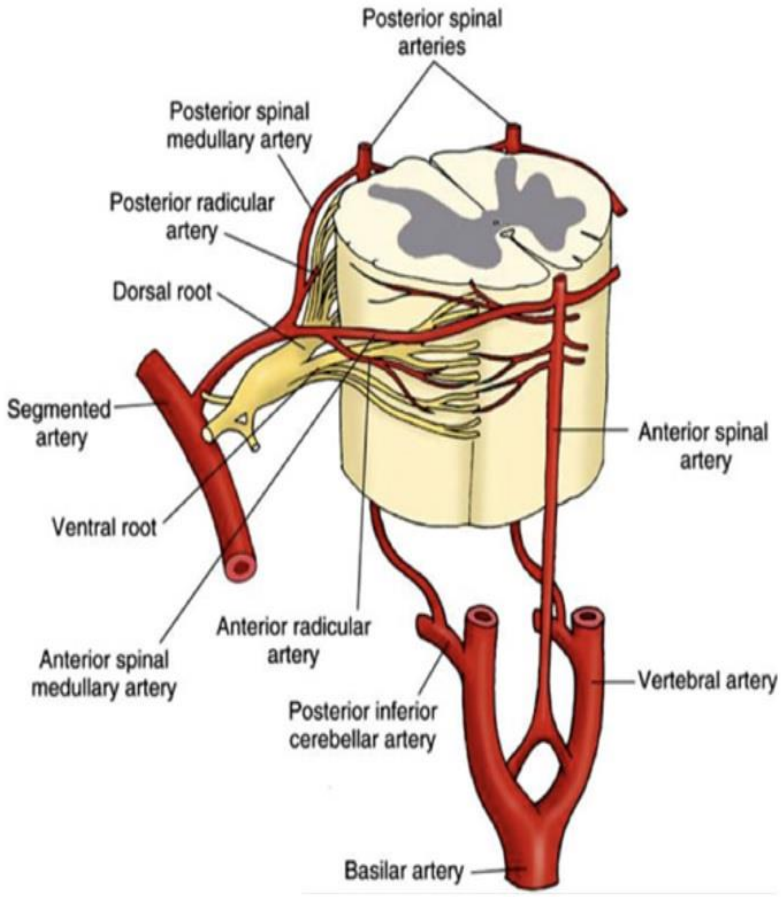


Figure 36: blood supply of spinal cord

3. Segmental (Radicular) Arteries
Origin: arise as twigs from the vertebral, ascending cervical, posterior intercostal &1st lumbar artery.
Course: They enter the vertebral canal through the intervertebral foramina. They give anterior & posterior radicular branches that pass along the ventral & dorsal roots to reach the surface of the spinal cord & form an arterial circle of anastomosis with the branches of anterior & posterior spinal arteries "arterial vasacorona". Branches from this circle supply the periphery of the spinal cord.
Some radicular arteries may be large & are called feeder arteries. One of the feeder arteries is called artery of which arises from 11th intercostal artery & may be the main supply to the lower two-thirds of the cord.



Note:

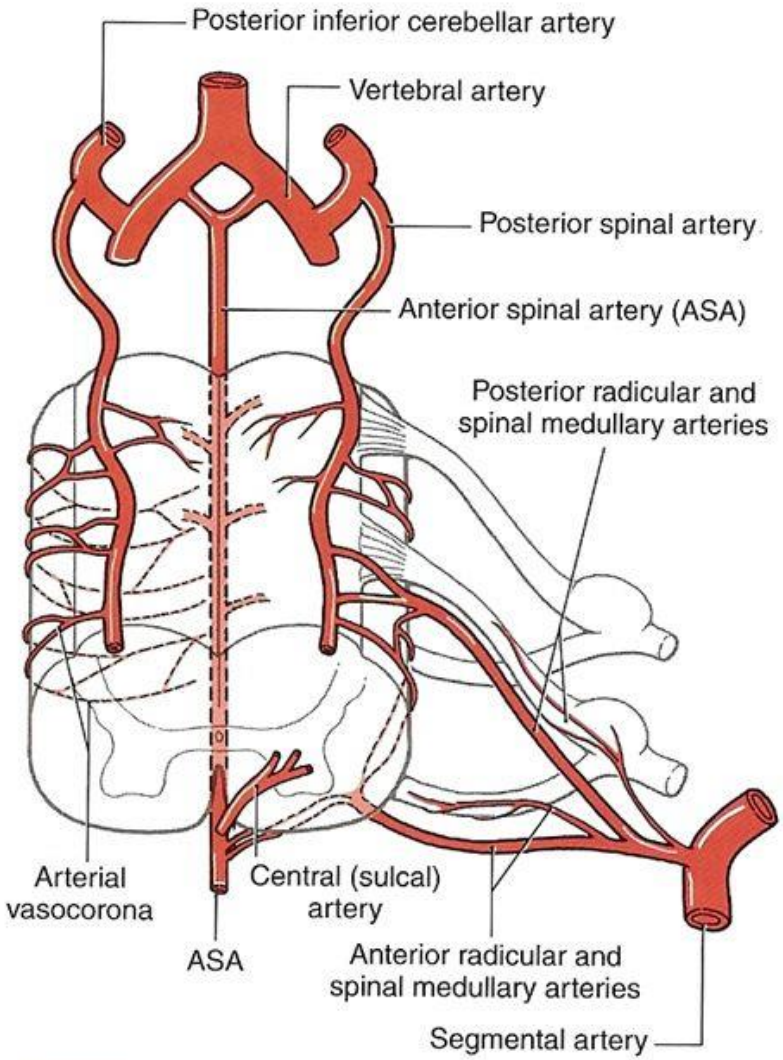
Once an artery enters the substance of the spinal cord, it is an end artery.

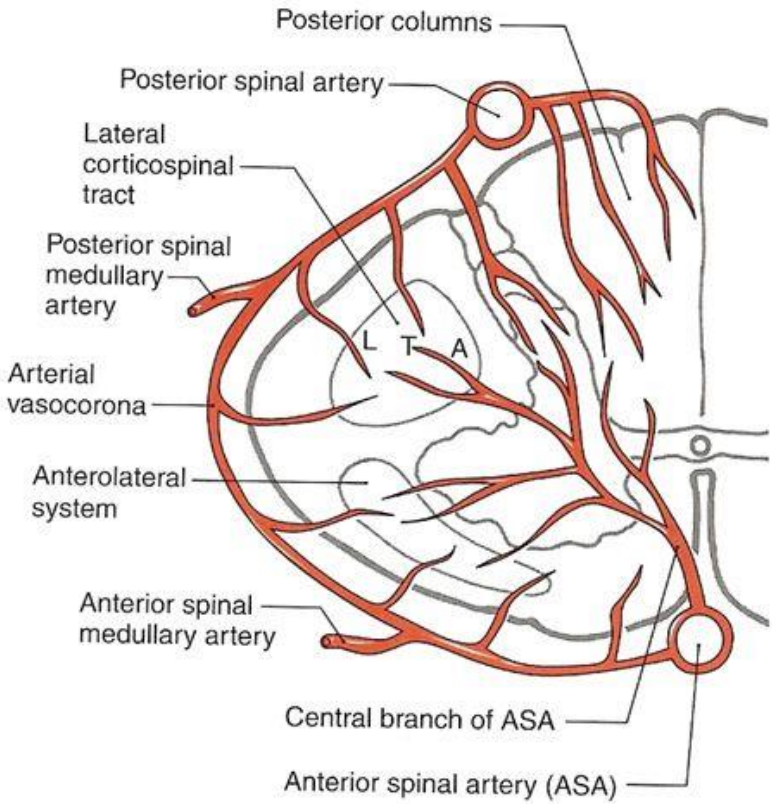
The cervical part of the spinal cord depends more on anterior & posterior spinal arteries, while lower segments depend more on the radicular arteries.

The mid-thoracic segments of the cord are the most liable to become ischemic.

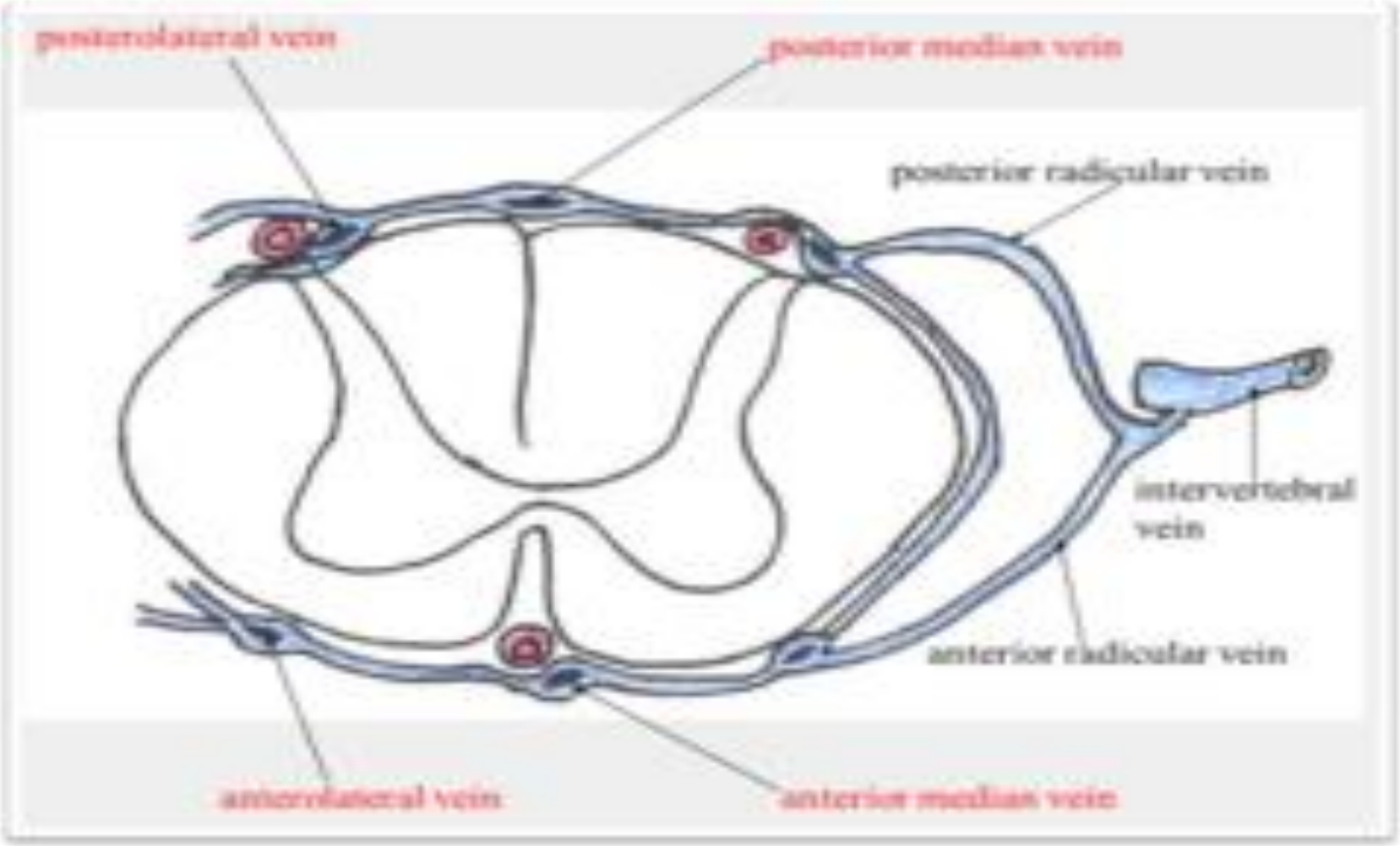
The richest blood supply is to the lumbar region.

BLOOD SUPPLY OF SPINAL CORD



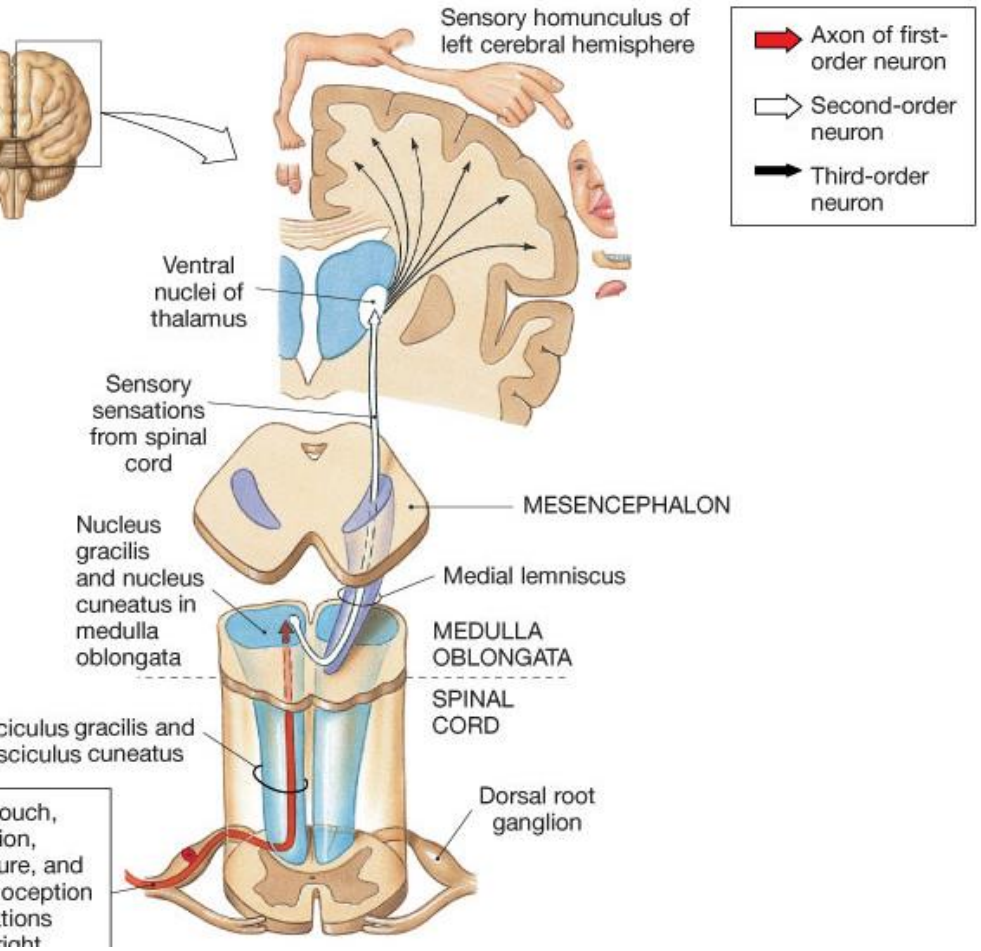


 Haines, Fundamental Neuroscience for Basic and Clinical Applications, 3rd edition, 2005, Fig. 8-25


posterolateral vein
posterior median vein
posterior radicular vein
intervertebral vein
anterior radicular vein
anterolateral vein
anterior median vein

Spinal cord lesions

Before the study the lesions ,lets remember the pathways for the sensations.



Spinal Cord lesions

Complete transverse section

- Above C5 → Death due to paralysis of diaphragm & intercostal muscles
- Between C5 & T1 → Quadriplegia
- Below T1 → Paraplegia

Hemi-section of Spinal Cord

Brown sequard syndrome

At level of lesion;

1-Ipsilateral loss of all sensations(damage of dorsal root)

2-Ipsilateral LMNL(damage of anterior horn)

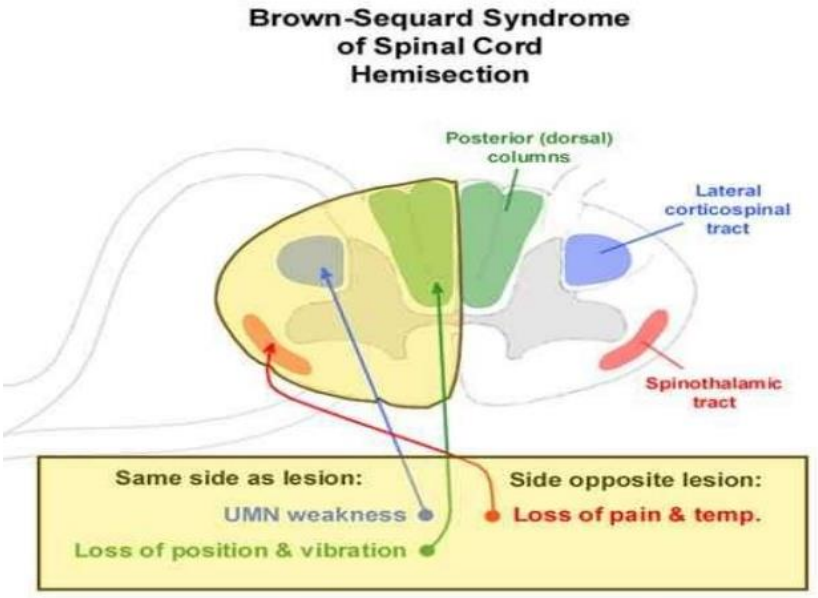
Below level of lesion ipsilateral:

1- loss of proprioceptive sensations due to destruction of post white column

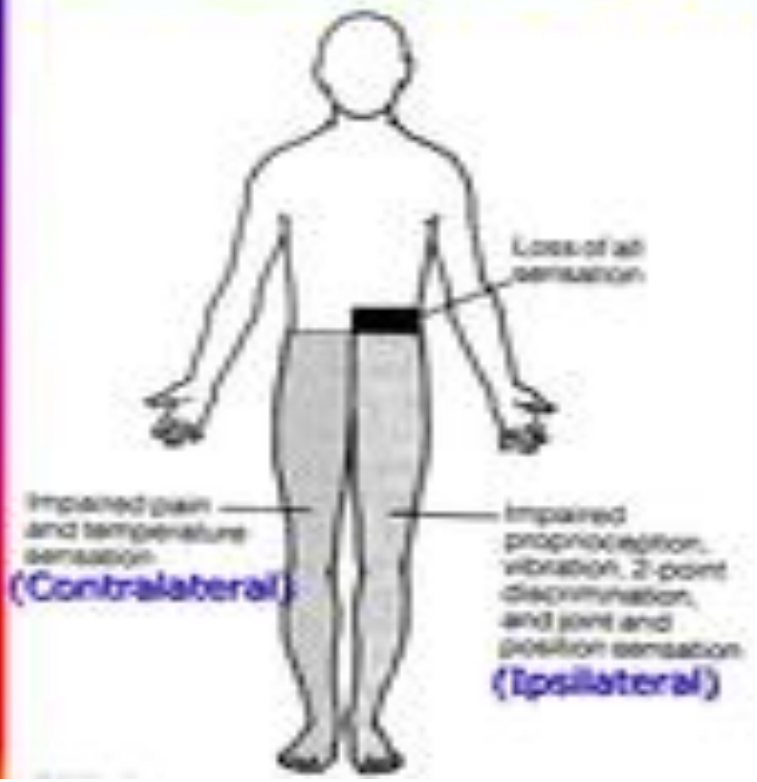
2- UMNL: due to affection of lateral corticospinal

Below level of lesion contra lateral

1- loss of pain and temperature due to affection of lateral spinothalamic



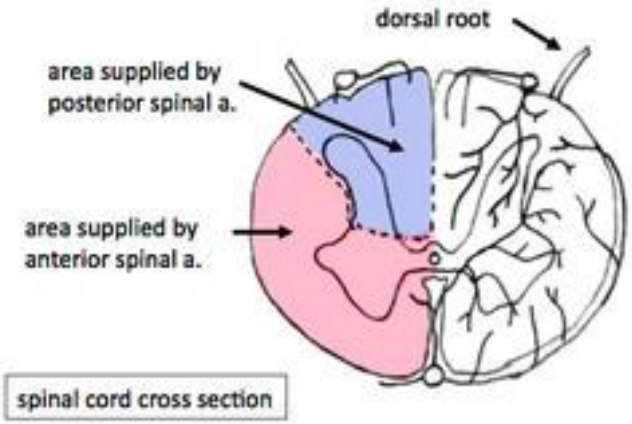
Brown-Séquard Syndrome

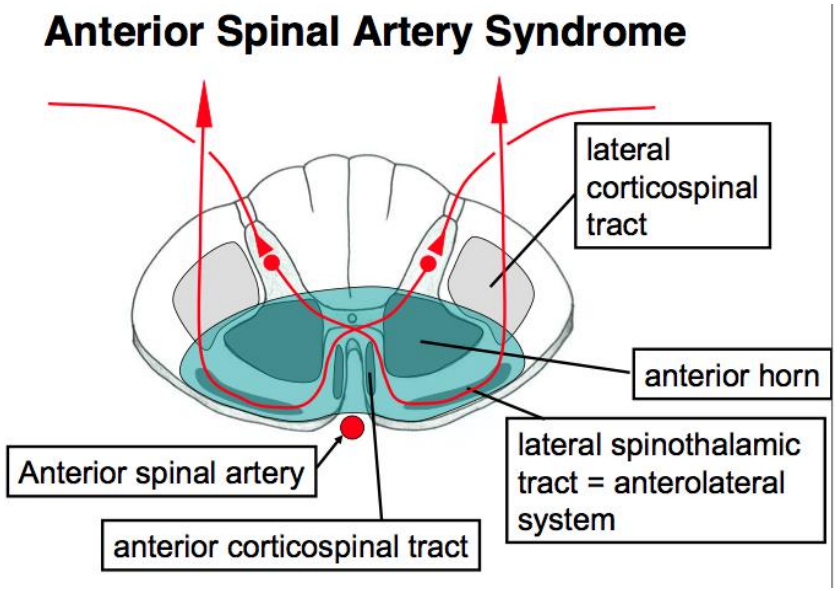


Hemisection of spinal cord

Anterior spinal artery occlusion

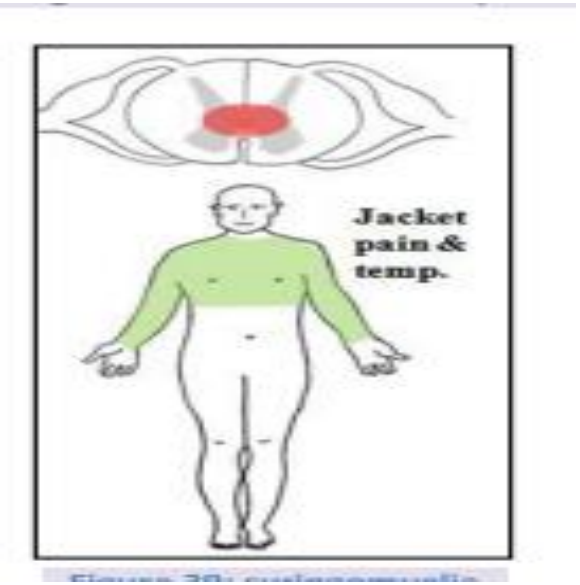
below lesion
Bilateral UMNL paralysis
Bilateral loss of pain and temperature
Preservation of proprioception and touch





Syringomyelia

- Cavitation around the central canal in the cervical and upper thoracic segments of the spinal cord
- degeneration of the crossing fibers carrying pain & temperature sensations.
- There is bilateral loss of pain & temperature sensations in dermatomes corresponding to the levels of crossing affected (jacket distribution of anesthesia).



Than you