



DESCENDING TRACTS MOTOR PATHWAYS

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Intended Learning Outcomes (ILOs)

By the end of the lecture, the students will be able to:

- Know the meaning of tract
- Know the descending tracts
- Know the origin, course, destination and function of tracts
- Know collectively the types of ascending tracts
- Know the descending tracts
- Know that the descending tracts are 2 types; pyramidal and extrapyramidal



Agenda

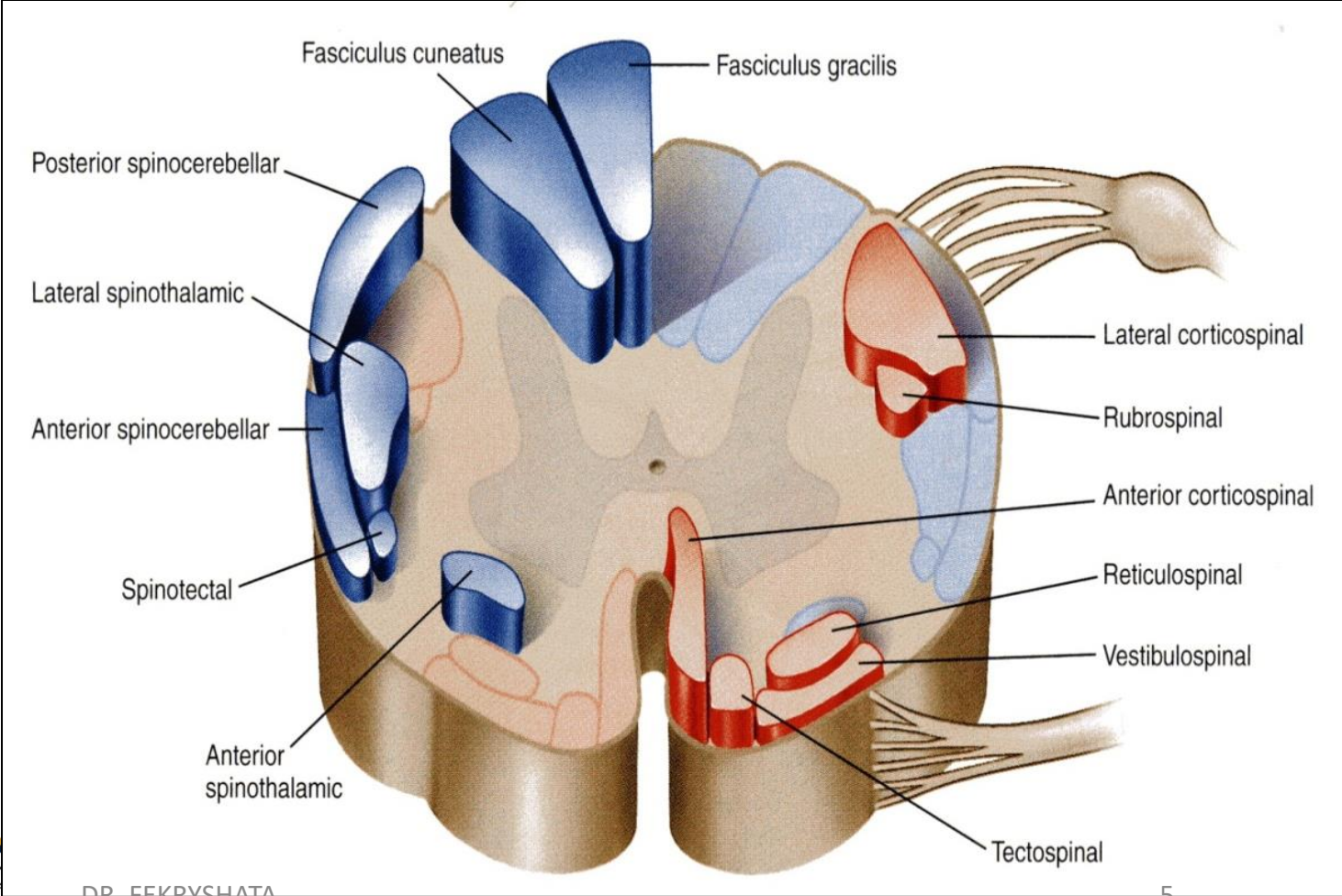
1. The meaning of descending tract
2. Origin, course, destination and function of tracts
3. Types of descending tracts, pyramidal and extrapyramidal tracts



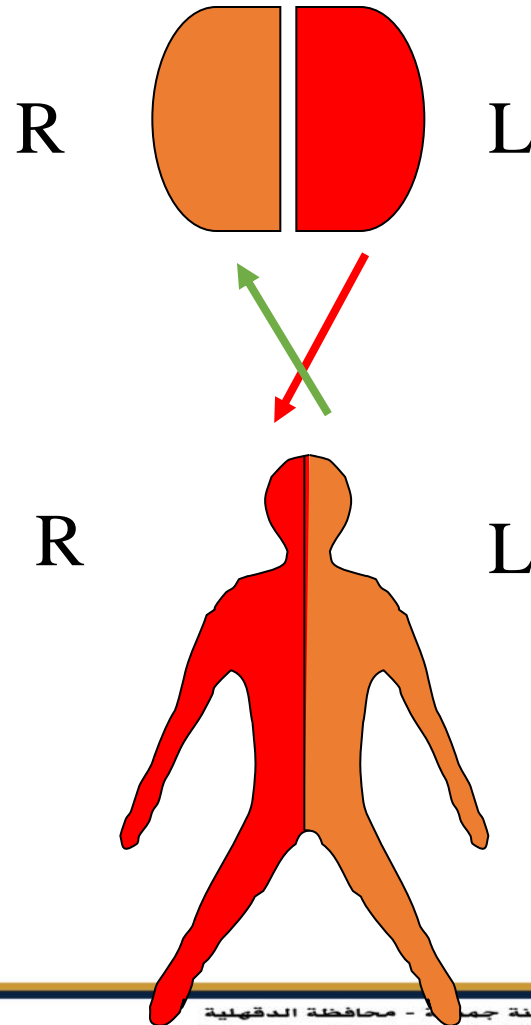
Motor Pathways

WHITE MATTER TRACTS

• Bundles or fasciculi of fibers have the same **Origin**, **Termination** and carry the same **Function**.



Control of the body by the brain



Contralateral representation
Decussation = Crossing

Contralateral = Opposite side
Ipsilateral = Same side

Descending tracts (Motor system)

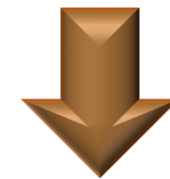
There are 3 different motor systems



**1- Pyramidal system:
(corticospinal tract
& corticobulbar tract)**



**2- Extrapyramidal
system**



**3- Motor
pathway to the
cerebellum**

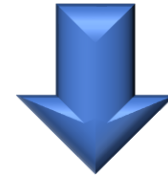




Pyramidal system

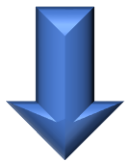


Pyramidal system



Corticospinal tract

Corticobulbar tract
to cranial nerve motor nuclei



Lateral Corticospinal tract

Ventral Corticospinal tract



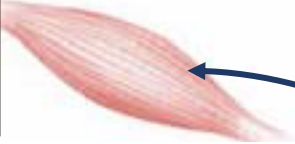
Pyramidal system

How to control your muscles?

Muscles of H&N



Muscles of the body

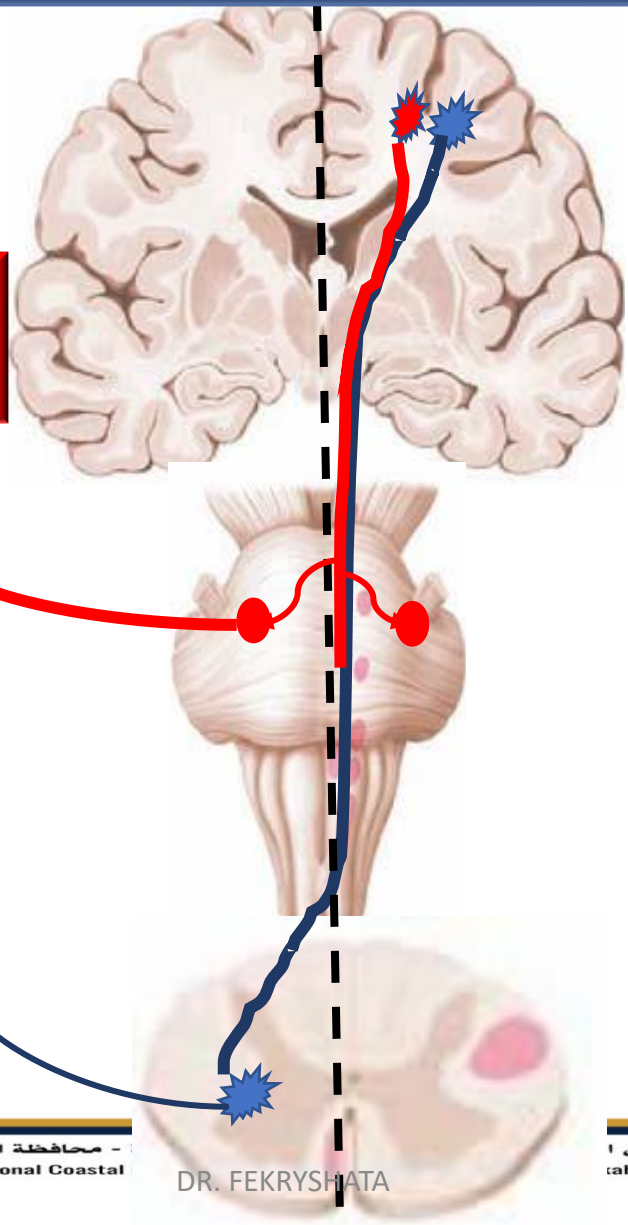


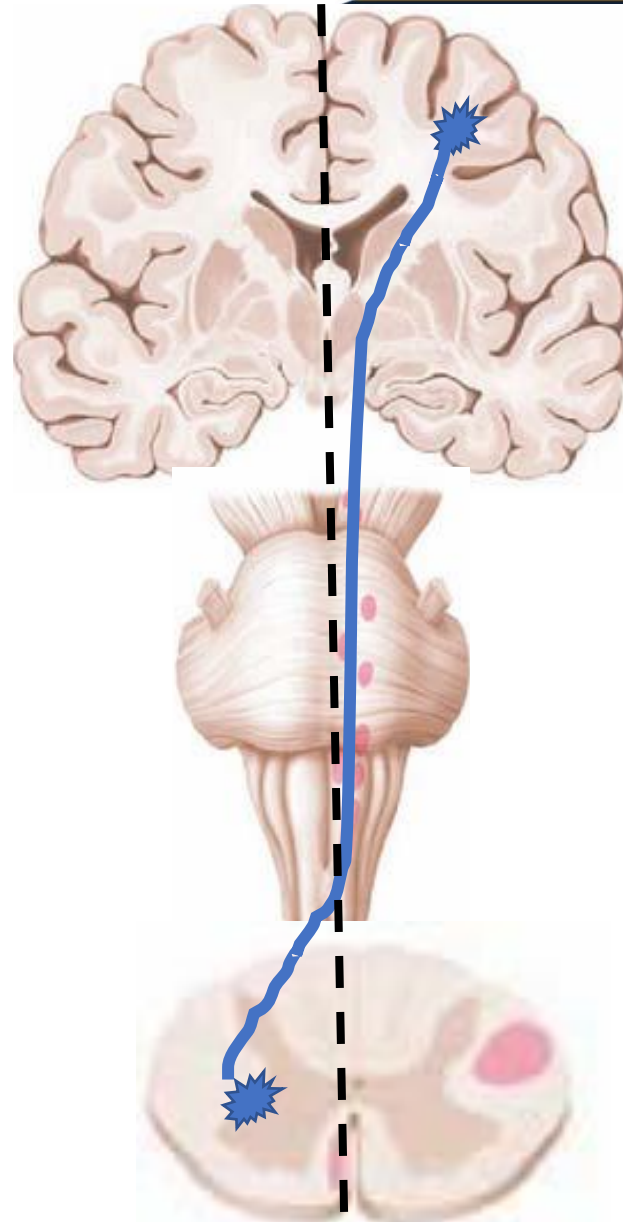
**LMN
Cranial nerves**

**LMN
Spinal nerves**

**UMN
Corticospinal**

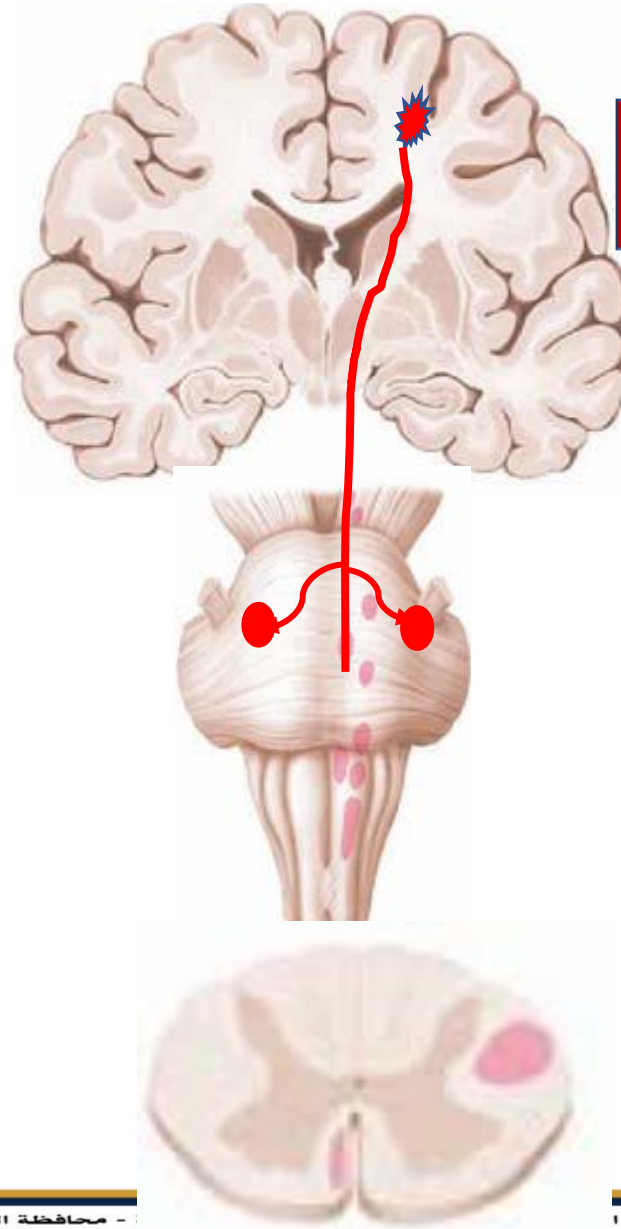
**UMN
Corticobulbar**





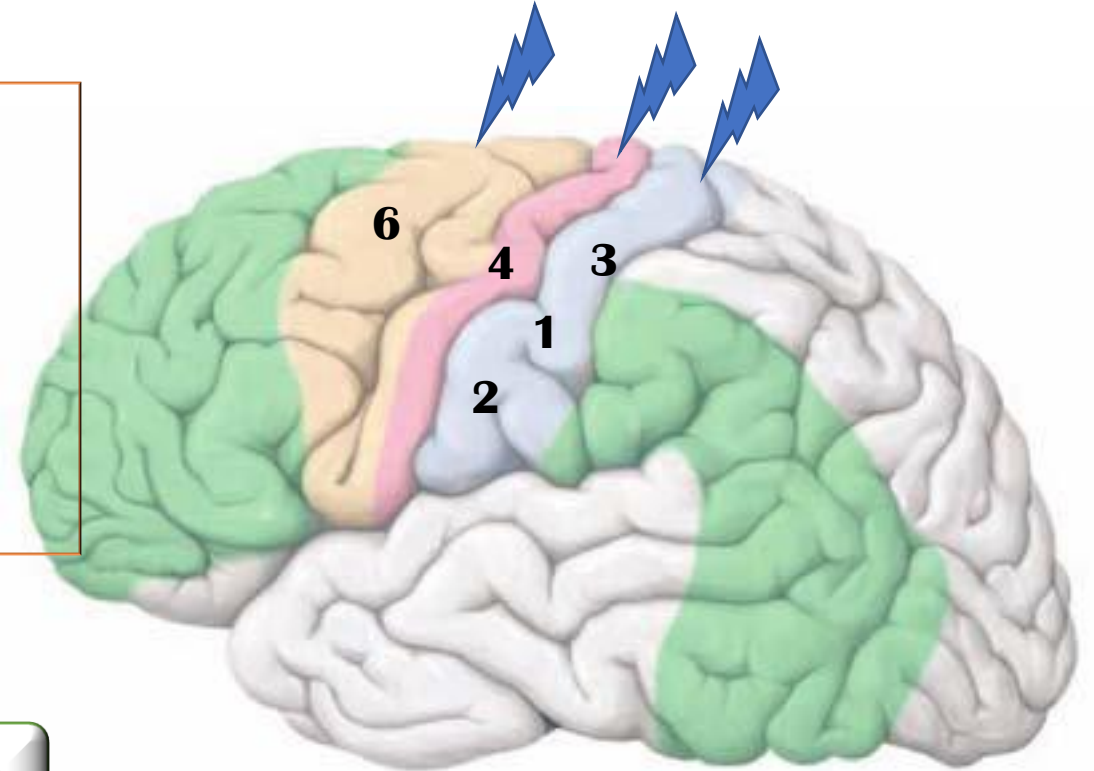
Corticospinal tract

Corticobulbar tract



Origin

- 40% of the fibers from upper two thirds of primary motor area 4
- 40% of the fibers from premotor area 6
- 20% of the fibers from general sensory area 3,1&2



Function:

- 1- Facilitation of the flexor muscle tone
- 2- Initiation of highly skilled fine movements
- 3- Modulate sensory input of the spinal cord

Course

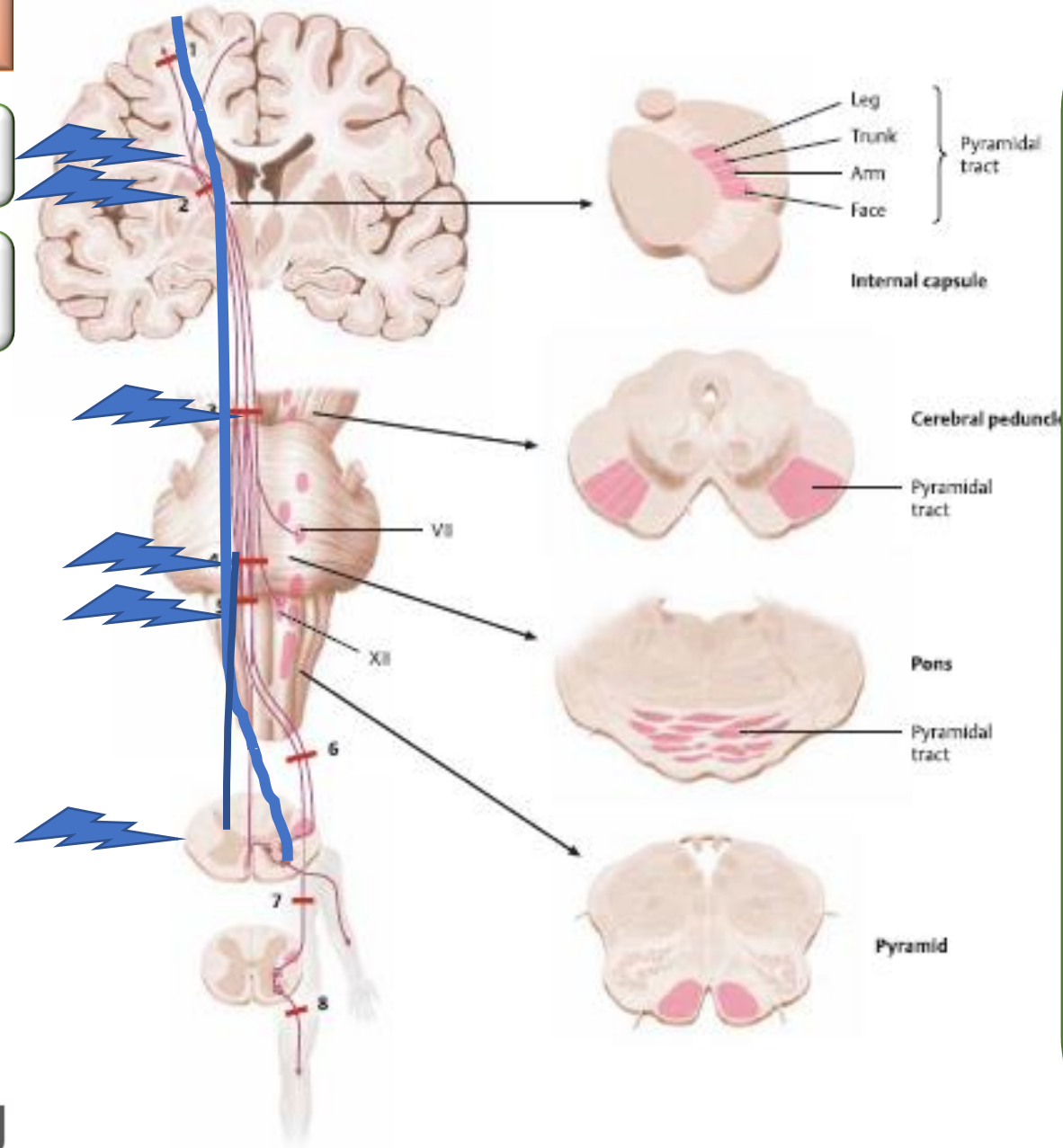
Corona radiata

Posterior limb of internal capsule

Crus cerebri

Basis pontis

Pyramid

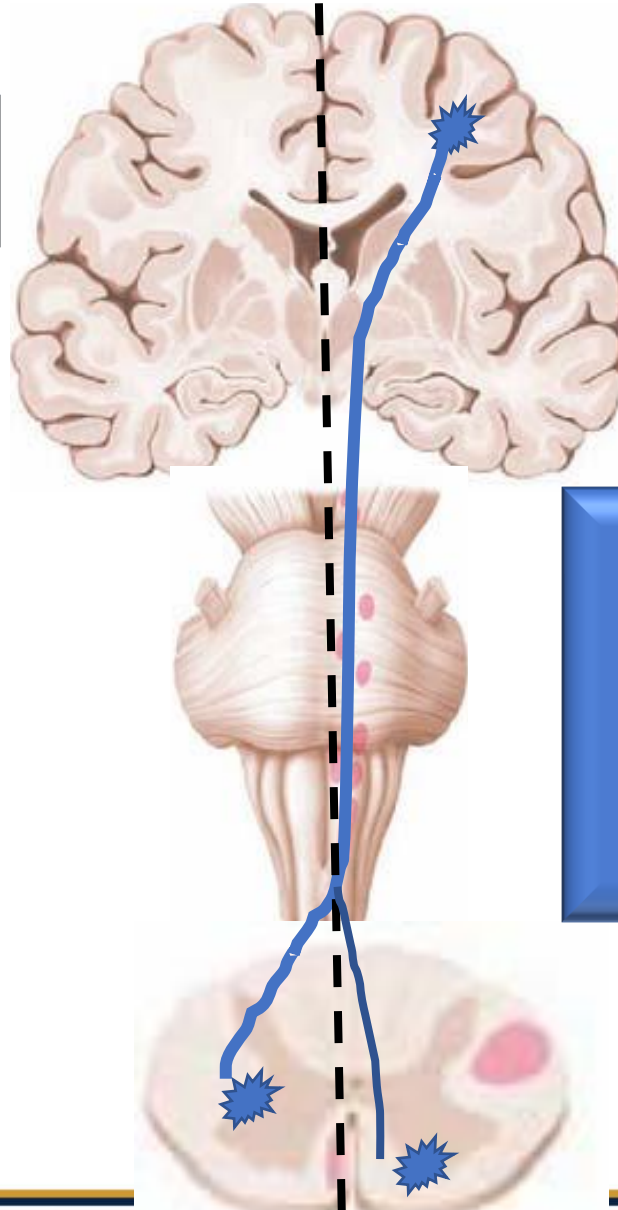


- **85% fibers cross to the opposite side and form lateral corticospinal tract.**

- **15% fibers remain uncrossed and form ventral corticospinal tract**

Corticospinal tract

85% fibers cross to the opposite side and form **lateral corticospinal tract**.



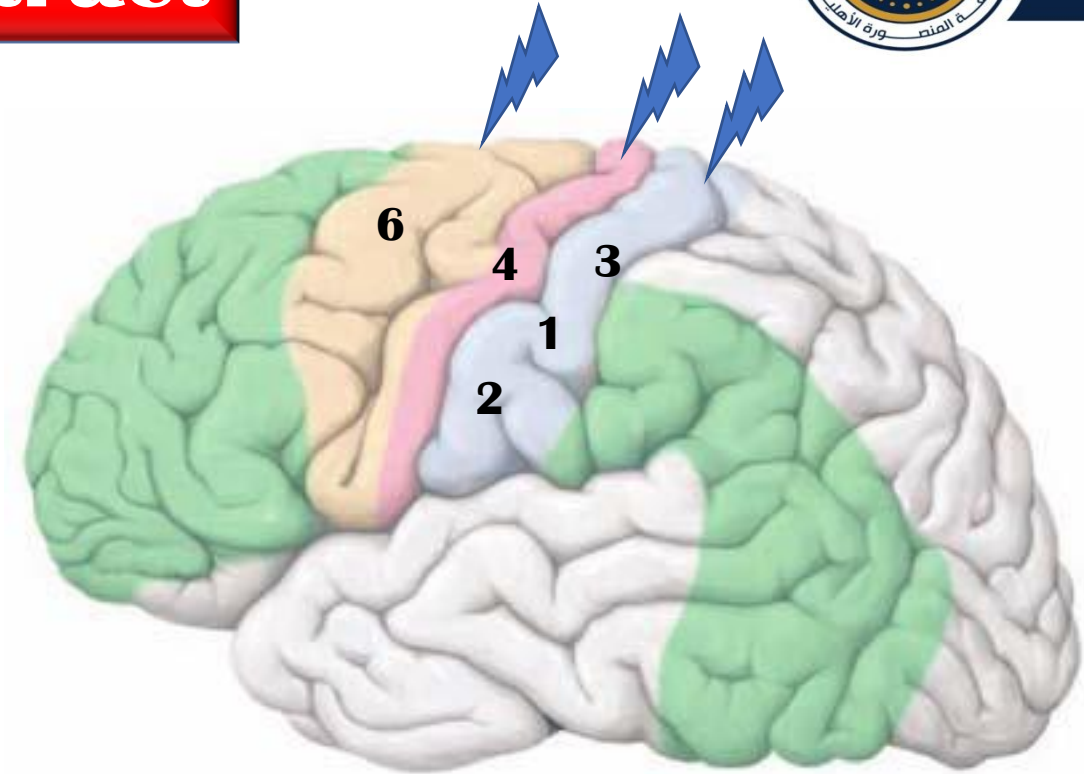
15% fibers remain uncrossed and form **ventral corticospinal tract**



Corticobulbar tract

Origin

- ❑ **40%** of the fibers from **lower third of primary motor area 4**
- ❑ **40%** of the fibers from **premotor area 6**
- ❑ **20%** of the fibers from **general sensory area 3,1&2**



Course:

Corona radiata

Genu of internal capsule

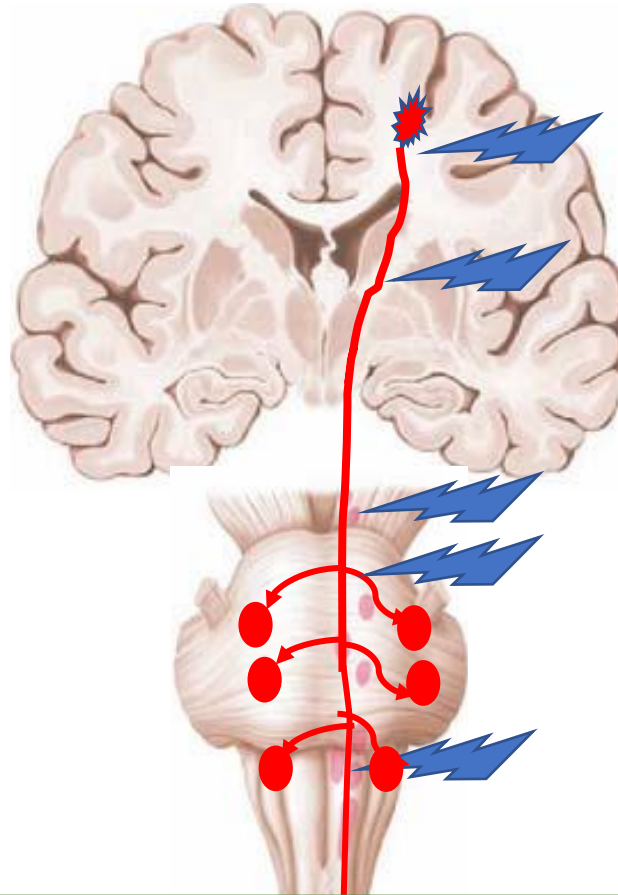
Crus cerebri

Basis pontis

Pyramid

Termination

- It terminates on the cranial nerve motor nuclei of the two sides.
- All cranial nerve motor nuclei receive bilateral corticobulbar fibers except the **lower part of facial nucleus** which receives fibers from opposite side only.



Motor system lesion

Causes:

- Trauma:** fracture , stab or bullets.
- Compression:** by tumor or herniated disc.
- Vascular:** by occlusion of the artery

Types of paralysis

LMNL

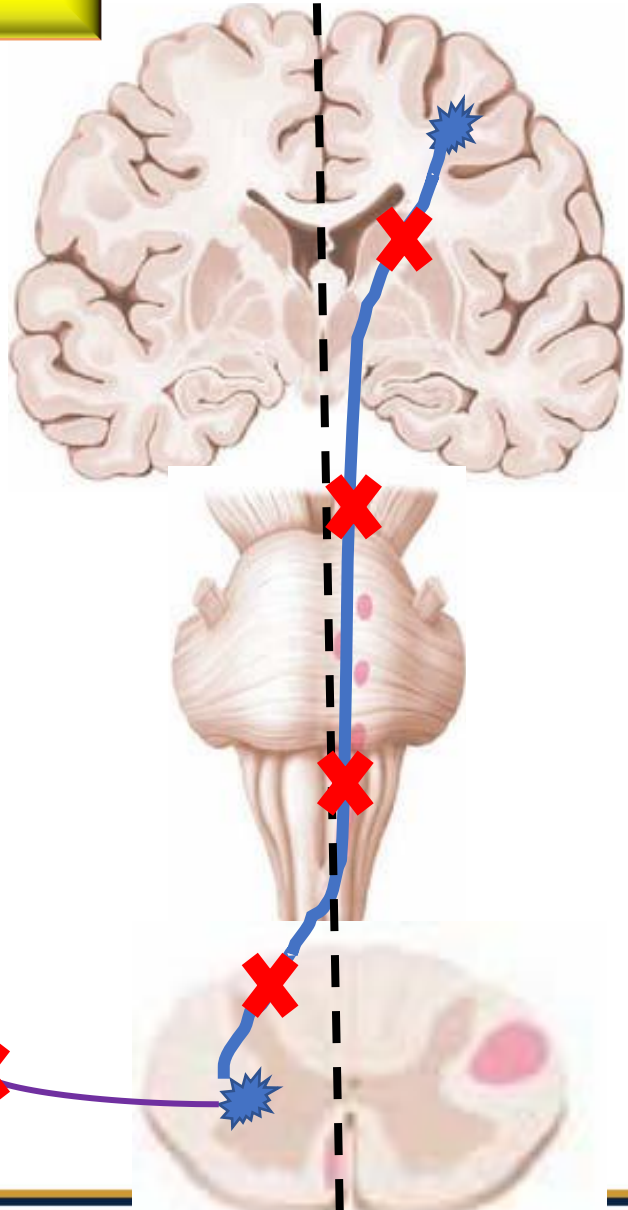
Flaccidity

Hypotonia

Hypo-reflexia

Fibrillation

Atrophy



UMNL

Spasticity

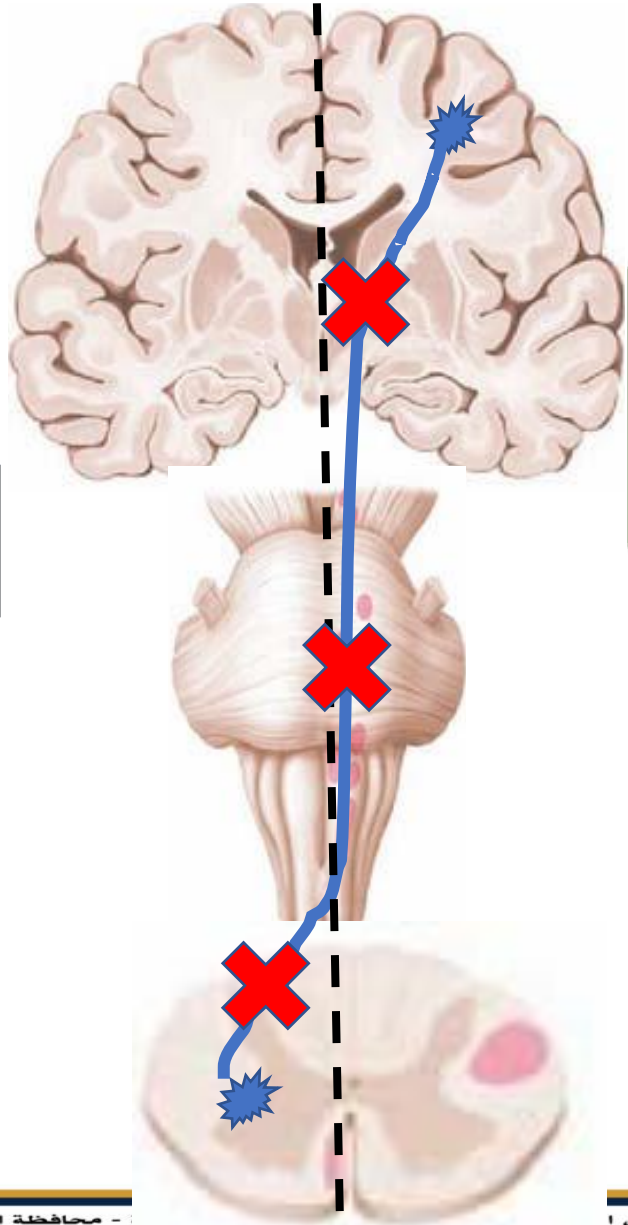
Hypertonia

Hyper-reflexia

Babinski sign

Clonus

Corticospinal tract



**1- lesion above the decussation:
contralateral hemiplegia**

**2- lesion below the decussation:
ipsilateral paralysis**

Lesion of Corticospinal tract

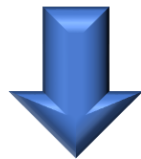
Lesion :

Type : it is UMNL

1- lesion above the decussation: contralateral hemiplegia

2- lesion below the decussation: ipsilateral paralysis

Sign of UMNL



Hypertonia

Hyper-reflexia

Spasticity

Babinski sign

Clonus

Loss of the superficial abdominal reflexes and cremasteric reflex

Lesion of Corticobulbar tract

Muscles of H&N

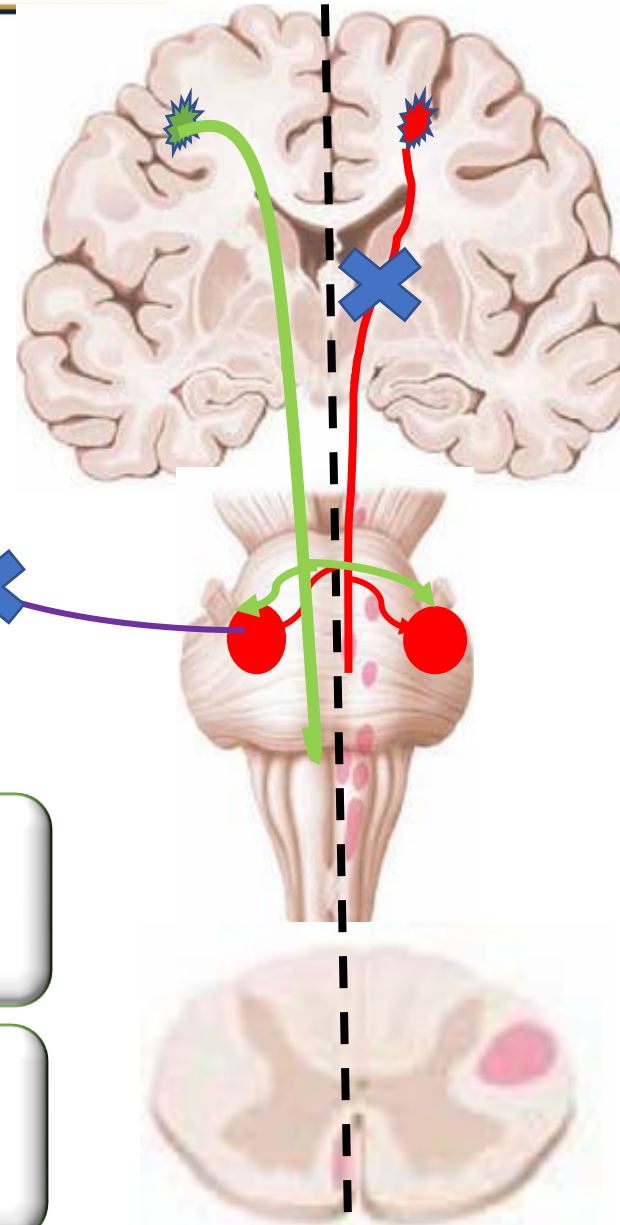
LMN
Cranial nerves

Lesion :

Type : it is UMNL

1- paralysis of the lower part of the contralateral facial nerve nucleus

2- weakness of the muscles supplied by the cranial nerves



**UMN
Corticobulbar**



2- Extrapyramidal system



2- Extrapyramidal system

Connection between the cerebral cortex and spinal cord through the brain stem

Function:

All pyramidal and extrapyramidal tracts **facilitate the flexor muscle tone** except the 2 tracts which arise from the pons facilitate the extensor muscle tone:

- 1- pontine vesibulospinal tract (vesibulospinal).**
- 2- pontine reticulospinal tract**

Extrapyramidal tracts

TWO

A- From the midbrain:

1- Rubrospinal tract:

2- Tectospinal tract:

TWO

B- From the vestibular nuclei:

**1- pontine vesibulospinal tract:
(vesibulospinal)**

**2- medullary vesibulospinal
tract: (Sulcomarginal)**

TWO

C- From the Reticular formation:

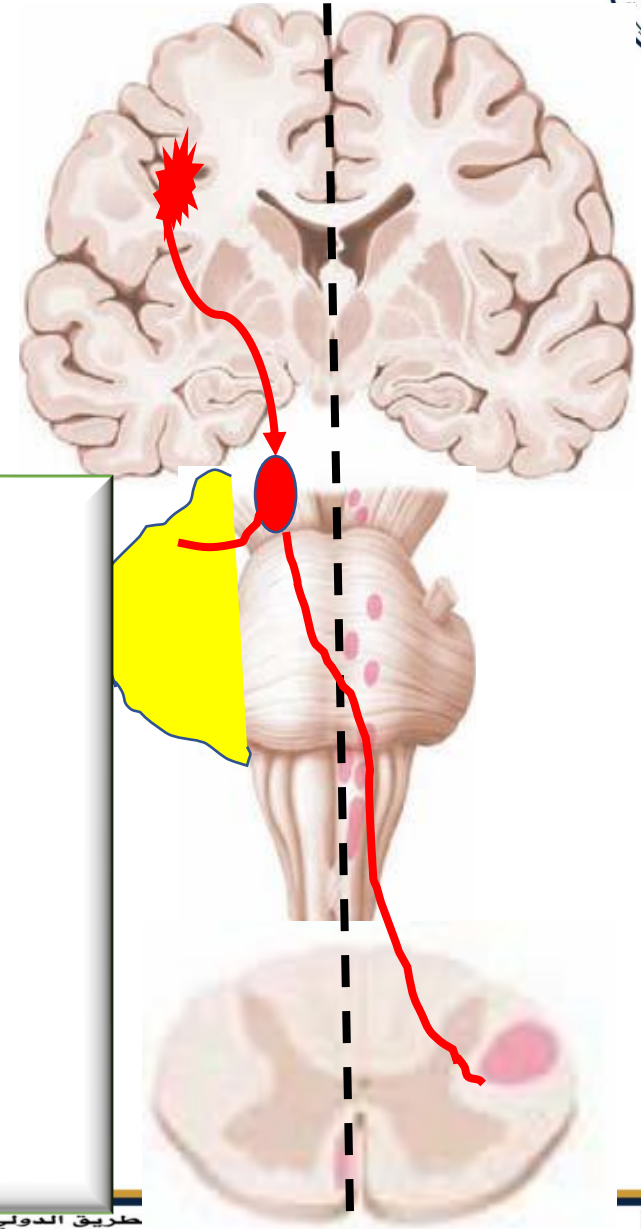
1- pontine reticulospinal tract:

**2- medullary reticulospinal
tract:**

A- From the midbrain:

Rubrospinal tract:

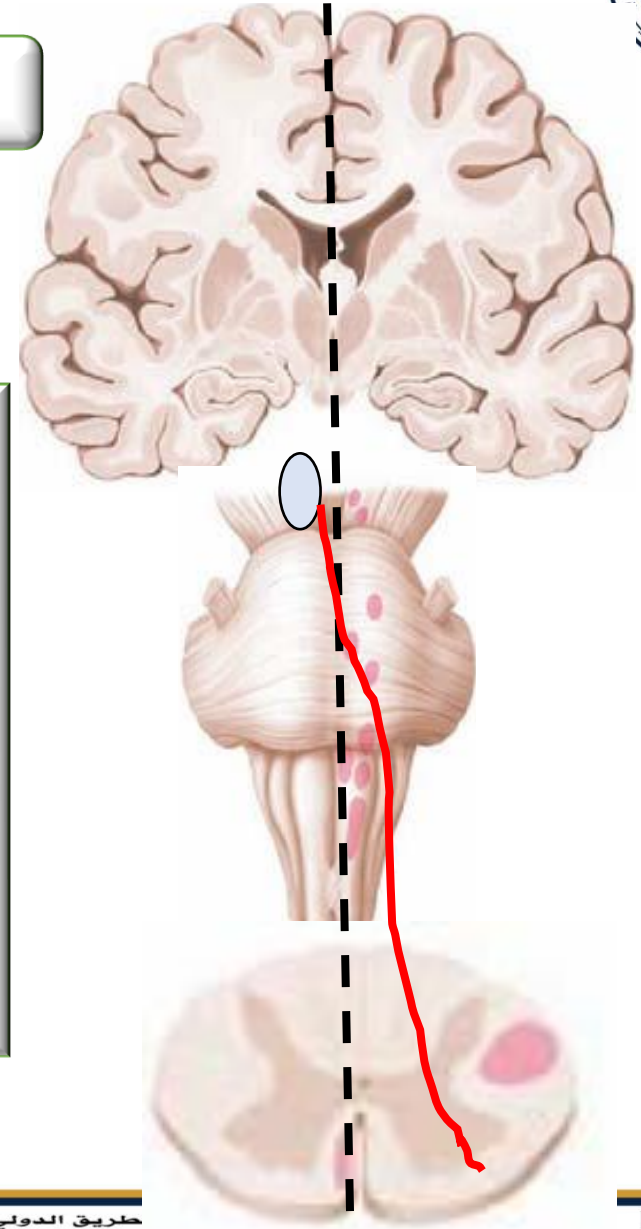
- ❑ **Origin:** red nucleus of the opposite side.
- ❑ **Function:**
 - Carries information from cerebral cortex & cerebellum to the spinal cord
 - Facilitate the flexor muscle tone.



A- From the midbrain:

Tectospinal tract:

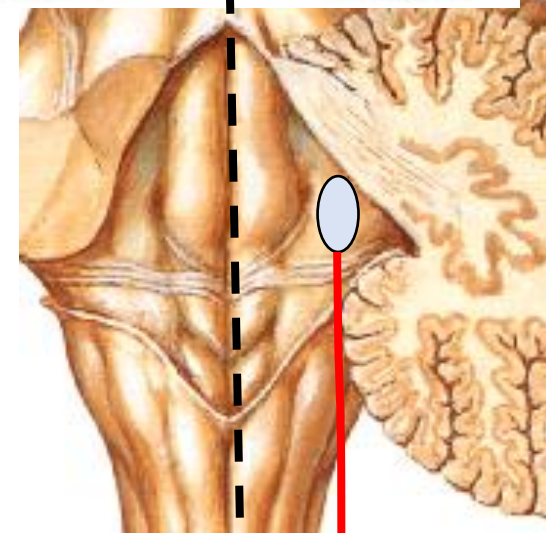
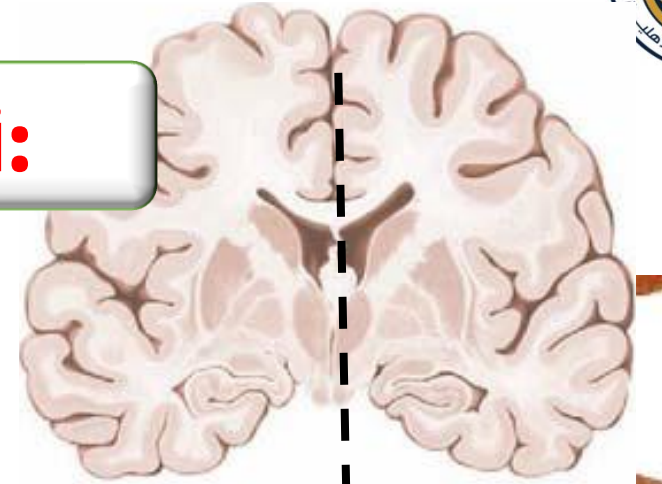
- ❑ **Origin:** superior colliculus of the opposite side.
- ❑ **Function:**
 - Reflexes associated with **vision and hearing**



B- From the pontine vestibular nuclei:

Pontine vesibulospinal tract: (vesibulospinal)

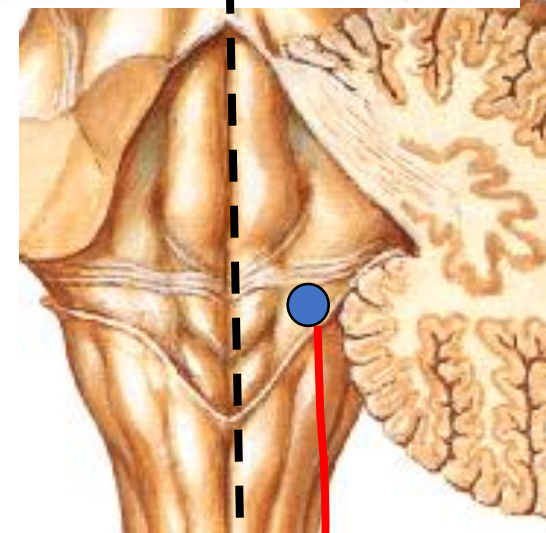
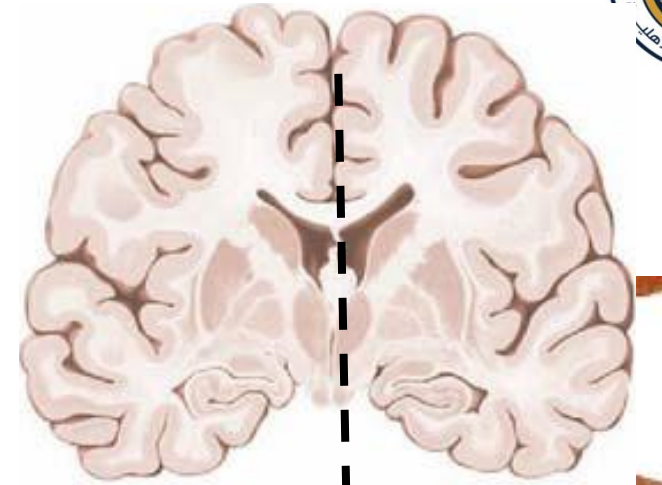
- ❑ **Origin:** from lateral vestibular nucleus.
- ❑ **Function:**
 - Facilitate the **extensor** muscles tone.



B- From the medullary vestibular nuclei:

Medullary vesibulospinal tract: (Sulcomarginal)

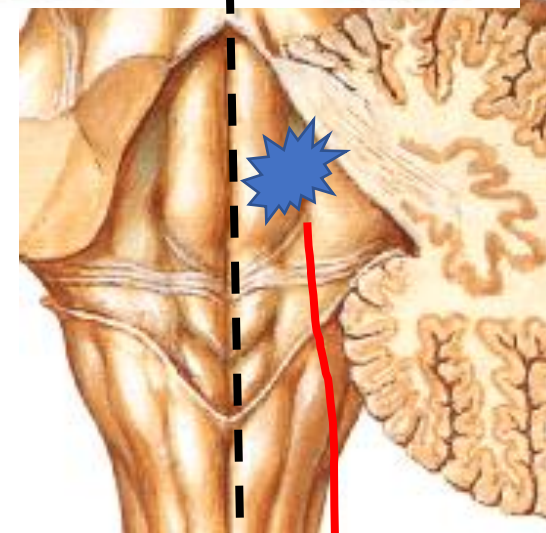
- ❑ **Origin:** from medial vestibular nucleus.
- ❑ **Function:**
 - Facilitate the **flexor** muscles tone.



C- From the Reticular formation:

Pontine reticulospinal tract:

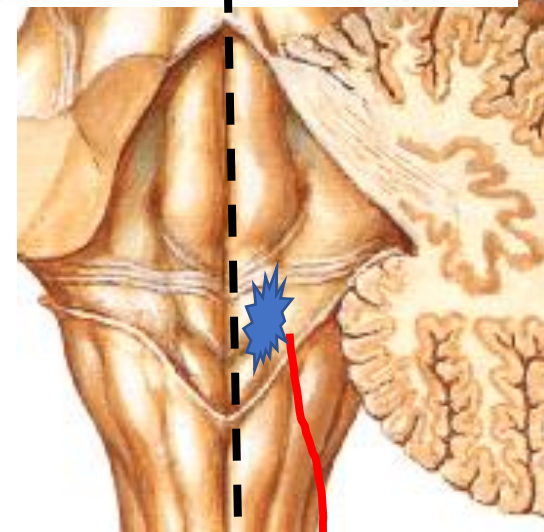
- ❑ **Origin:** from pontine reticular formation.
- ❑ **Function:**
 - **Facilitate the extensor muscles tone.**



B- From the Reticular formation:

Medullary reticulospinal tract:

- ❑ **Origin:** from medullary reticular formation.
- ❑ **Function:**
 - Facilitate the flexor muscles tone.

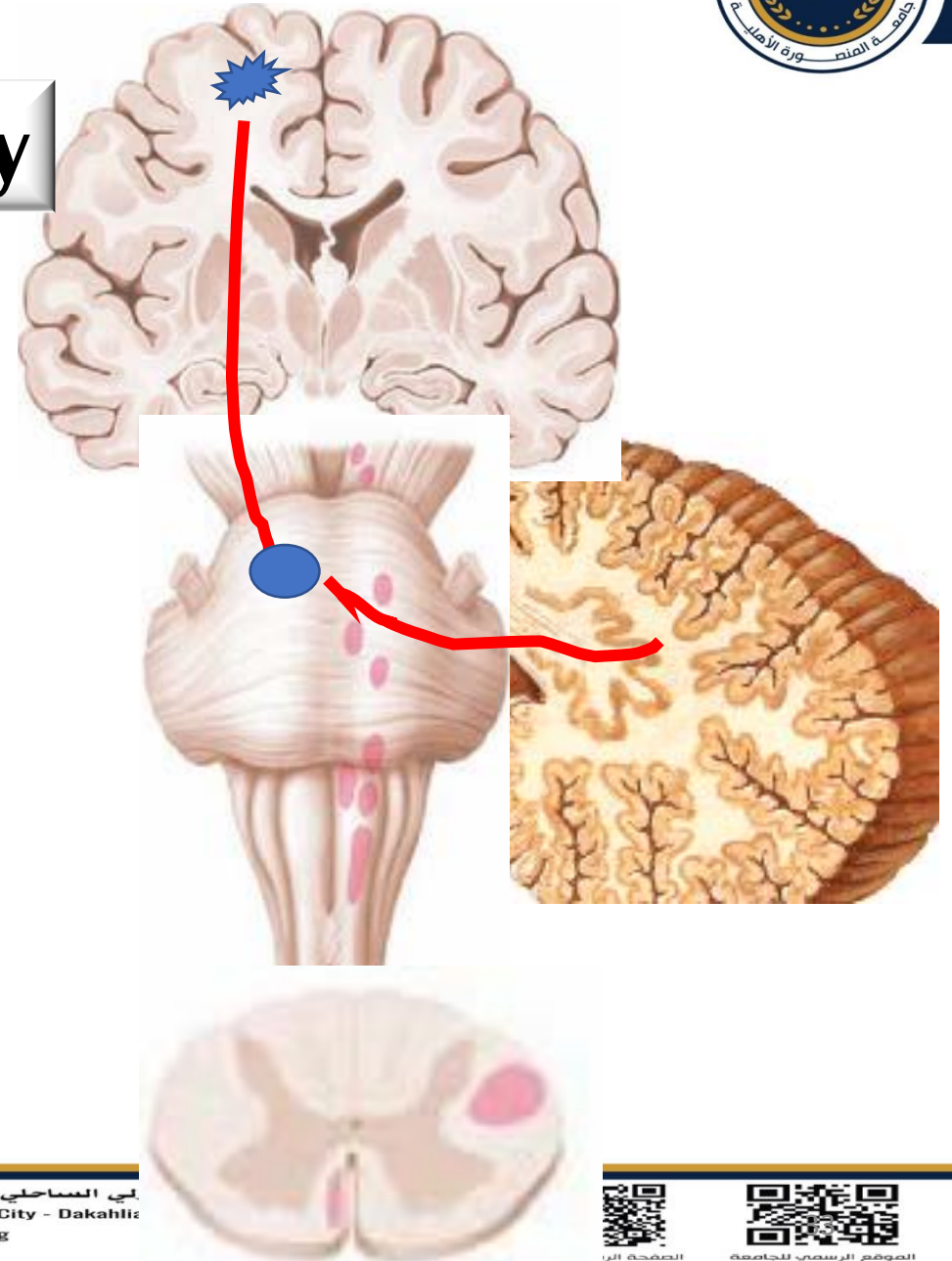




3- Motor pathway to the cerebellum

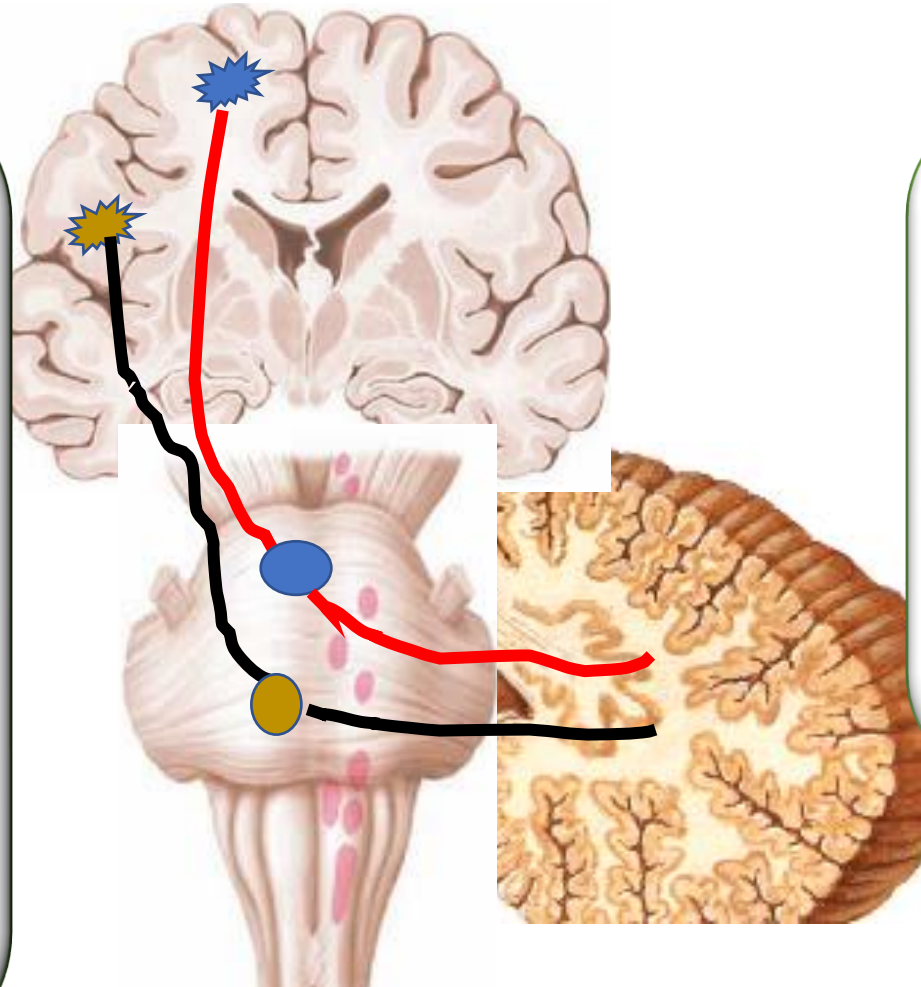


3- cortico-ponto-cerebellar pathway



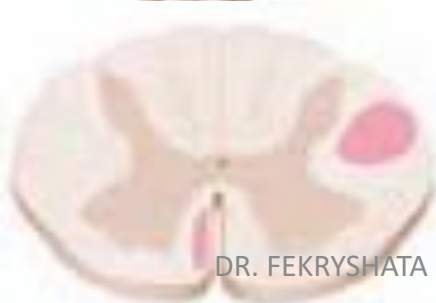
B- non fronto-pontine fibers:

- **From the parietal, temporal and occipital lobes.**
- **Transmit sensory information.**



A- Fronto-pontine fibers:

- **From the frontal lobe.**
- **Transmit motor information.**





Descending Autonomic Fibers



Descending Autonomic Fibers

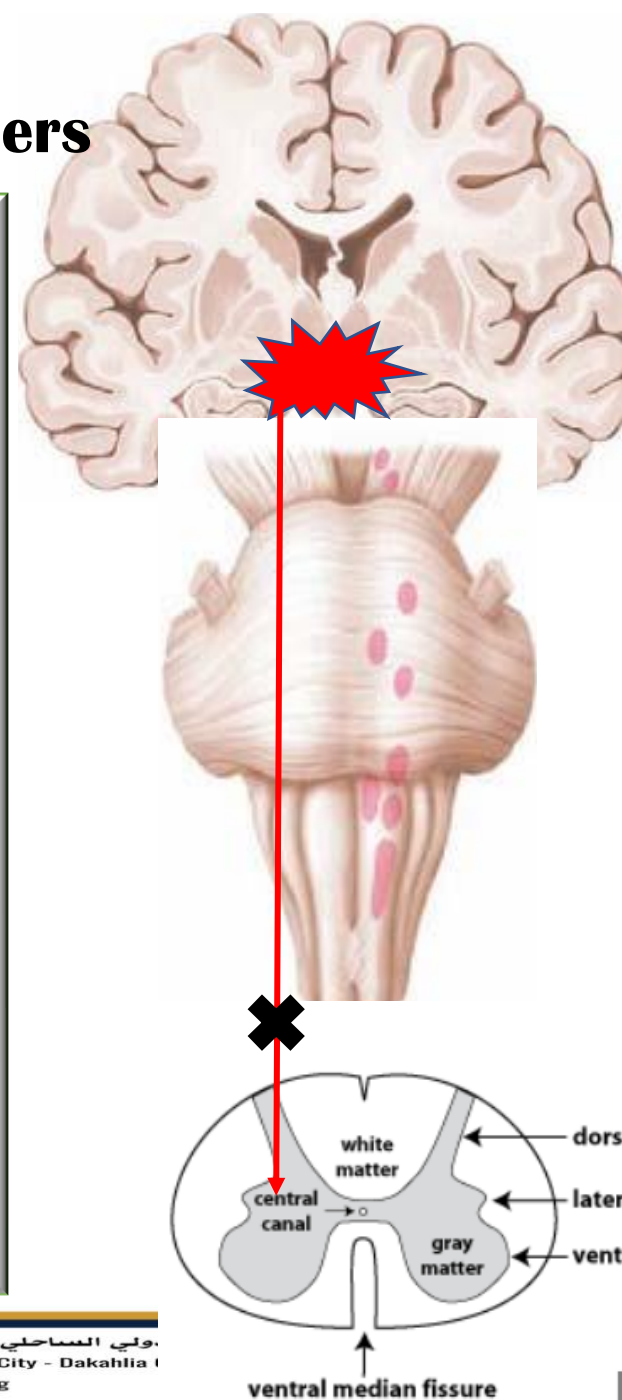
❑ **Origin:** from hypothalamus and autonomic centers in the reticular formation.

❑ **Termination:**

- Sympathetic nucleus in the lateral horn of spinal cord (T₁—L₃).
- Sacral parasympathetic nucleus (S₂—S₄).

❑ **Lesion:**

- Above T₁ will cause Horner's syndrome



Horner's syndrome



- Ptosis:** paralysis of muller's muscle.
- Miosis:** constriction of pupil.
- Anhidrosis:** dry face due to paralysis of sweat glands.
- Enophthalmos:** retraction of the eyeball.
- Flushing:** warm and red face

Quiz

1. **40%** of the corticobulbar fibers from
- A. lower third of primary motor area 4**
 - B. Upper two thirds of primary motor area 4**
 - C. Premotor area**
 - D. General sensory area**

Answer: A

Quiz

2. **40%** of the corticospinal fibers from

- A. lower third of primary motor area 4
- B. Upper two thirds of primary motor area 4
- C. Premotor area
- D. General sensory area

Answer: A

References for further readings

- Oxford Handbook of Clinical Medicine (3rd edition).
- Gray's anatomy for students
- The Clinical Practice Of Neurological and Neurosurgical Nursing Fourth Edition.

