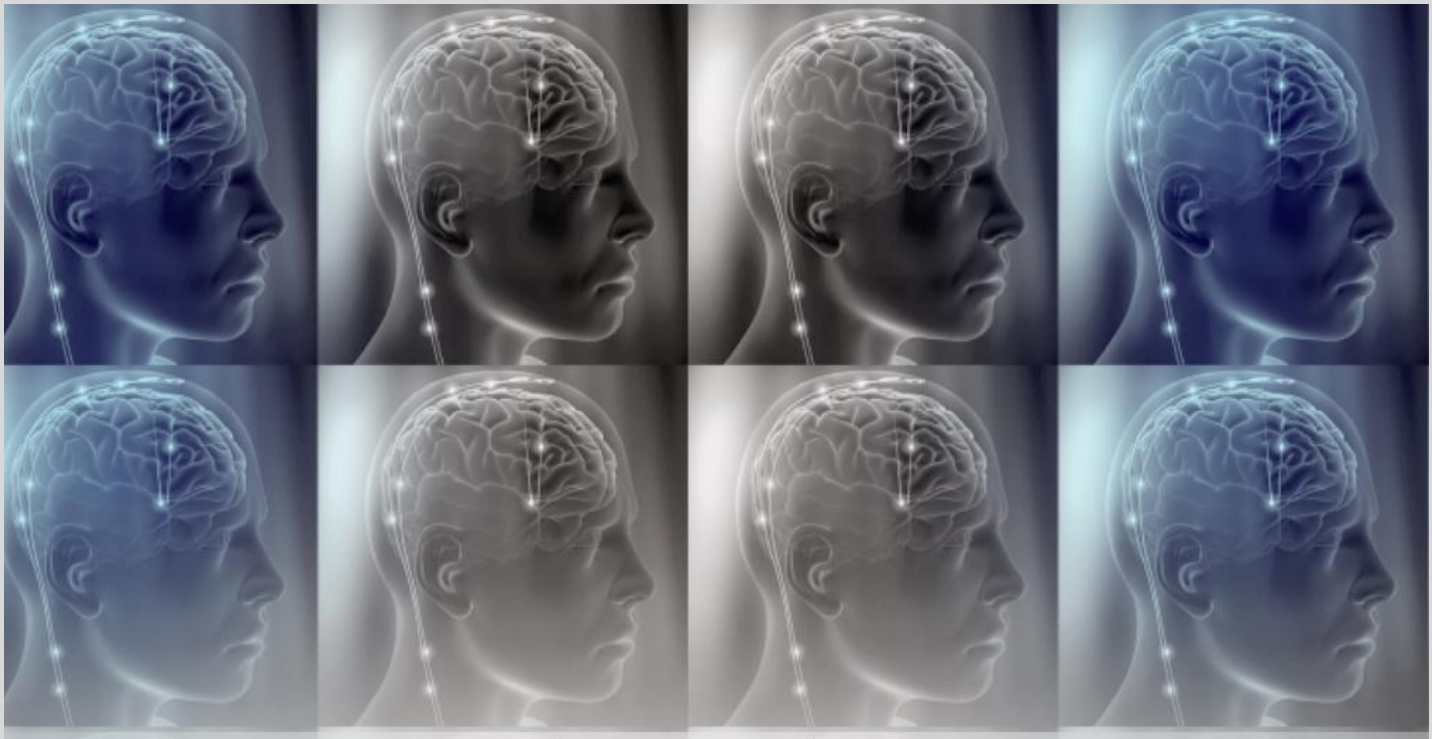

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CNS Central Nervous System

Block

Physiology Team

	Female Side	Male side
Done By:	Yafa alshamlan	Fahad Al-shwaishi
Revised By:		

CNS Central Nervous System

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Slide No.(1)

Objectives:

Upon completion of this lecture, students should be able to:

- Describe the upper and lower motor neurons Understand the pathway of Pyramidal tracts (Corticospinal & corticobulbar tracts)
- Understand the lateral and ventral corticospinal tracts.
- Explain functional role of corticospinal & corticobulbar tracts
- Describe the Extrapyramidal tracts as Rubrospinal , Vestibulospinal ,Reticulospinal and tectospinal tracts

Team Notes :

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Slide No.(2)

Upper & lower motorv neurons

1-Upper motor neurons (UMN):- - neurons of motor cortex & their axons that activates cranial & spinal motor neurons -There are two UMN Systems : 1- Pyramidal system (corticospinal tracts). 2- Extrapyramidal system

2- lower motorv neurons(LMN)

Spinal motor neurons in the spinal cord & cranial motor neurons in the brain stem that innervate muscles directly

Team Notes :

UMN= from cortex to alpha and gamma motor neurons

LMN= continuation of UMN (sends fibers from alpha and gamma to muscles)

(are the motor neurons connecting the brainstem and spinal cord to muscle fibers, bringing the nerve impulses from the upper motor neurons out to the muscles)

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Slide No.(3)

Descending Tracts

1-Pyramidal tracts = Corticospinal & corticobulbar tracts;-

-origin →

1- 30% motor area 4 (the primary motor area) (M1)

Occupies the precentral gyrus.

2- 30% from the premotor areas& supplemetary cortex

- Premotor area:- (motor association area) lies in front of the primary motor area & below supplementary motor area. • Stimulation of the premotor area produces complex coordinated movements, such as setting the body in a certain posture to perform a specific task

- Supplemetary cortex is a small area located on the lateral side of the brain in front of area 4 and above the pre-motor area & extends on medial side of the cerebral hemisphere. • This area projects mainly to M1 and is concerned with planning and programming motor sequences.•

3- parietal cortex 40% (somatic sensory area 3,1,2)

Team Notes :

corticospinal= from cortex to alpha mn in spinal cord, which send fibers to muscles

Corticobulbar=from cortex to brain stem, which send cranial nerves to head, face and neck .

Motor association area= helps the primary cortex

Specific tasks examples:

1-you need to sit properly if you want to have a good hand writing

2-swinging your arms respectively while walking (automatically without thinking)

supplementary cortex= helps the premotor area, and it is responsible for all bilateral movements like typing, piano playing….

Somatic sensory area= responsible for all senses of the body although it gives origin to pyramidal tract (which is motor).

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• 3% of the pyramidal fibers are large myelinated fibers, derived from the large, highly excitable pyramidal Betz cells in motor area 4.

• These fibers form monosynaptic connections with motor neurons of the spinal cord

- Fibers from the cerebral cortex descend in >>>>CORONA RADIATA to >>>>INTERNAL CAPSULE genu and the anterior two-third of the posterior limb >>>>>>BRAIN STEM (midbrain,pons,medulla oblongata)

Team Notes :

corona radiata= radiated fibers

internal capsule: is a site of hemorrhage because it is highly vascularized >>stroke

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In the brain stem Corticobulbar tract terminates on LMNs in the brain stem (fibers ends on cranial nerve nuclei of opposite side) -

Corticospinal tracts (pyramidal) descend through the midbrain and pons.

• In the lower medulla oblongata -the fibers form pyramids so called pyramidal (corticospinal) tract

Team Notes :

corticobulbar tract: cross the opposite side in the brain stem (early)

corticospinal tract descends then cross at the lower medulla (late)

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Slide No.(6)

A-CORTICOSPINAL(PYRAMIDAL) TRACTS divides into:_

1- lateral corticospinal tracts :- - 80% of fibers cross midline in pyramids - ends directly (not via interneurons = monosynaptic connections) on motor neurons (AHCs) of opposite side - Pass laterally in spinal cord so control distal limb muscles, so control fine skilled movements of the oppsite side.

2- ventral (anterior) corticospinal tracts :- -remaining 20% fibers does not cross midline - cross at level at which it ends to synapse with interneurons that synapse with motor neurons (AHCs) -pass medially in ventral horn so control axial & proximal limb muscles of the same side & control posture.

Team Notes :

AHCs= anterior horn cells of spinal cord.

Since corticobulbar tract ends in brain stem, it supplies head, face and neck

Fine skilled movements= writing, knitting, typing….. (using fingers especially the index and thumb).

Axial= axis region

Proximal=upper arm and thigh

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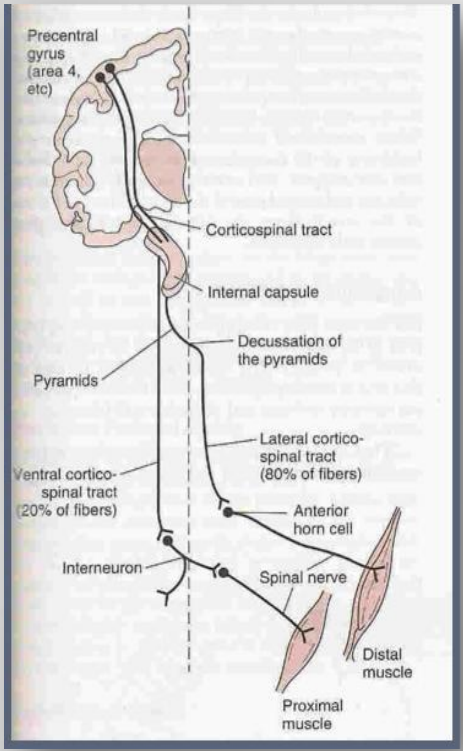
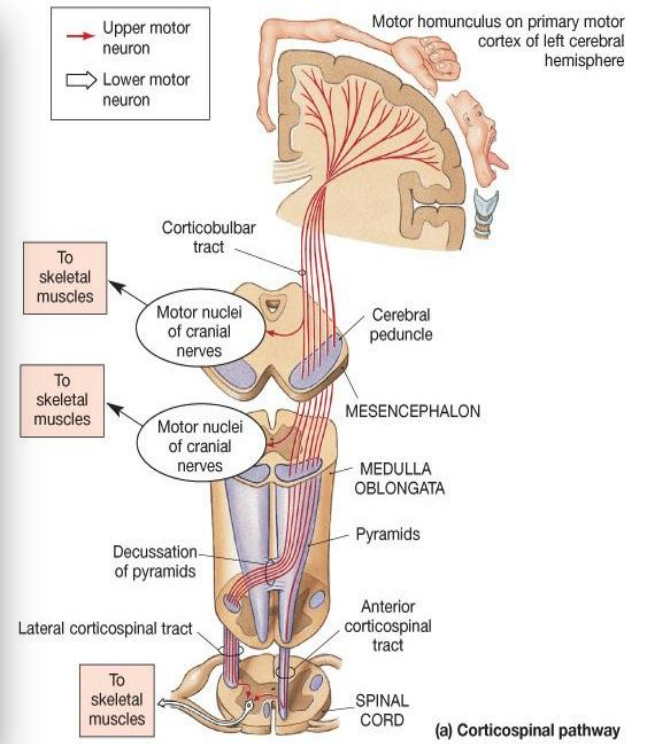
Slide No.(7)





Team Notes :

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Slide No.(8)

Functions of corticospinal tracts:-

1-**initiation** of fine skilled voluntary movements

2- lateral corticospinal control of distal muscles of limb as fingers & thumb which concerned with fine skilled movement) e.g Painting writing, picking up of a small object etc.

3- Ventral corticospinal tracts control posture of axial &proximal muscle for balance, climbing, walking

4-effect on stretch reflex

Team Notes :

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Slide No.(9)

Effect on stretch reflex:-

- Faccilitate muscle tone
  - those fibers originate from parietal lobe are for sensory-motor coordination.
  - Corticobulbar tracts /control face & neck muscles & facilitate their tone

Team Notes :

Skeletal muscle reflex is the result of facilitating gamma motor neurons

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Slide No.(10)

Extrapyramidal tracts

Extrapyramidal tracts :- Tracts other than corticospinal tract & are outside pyramids

Origin/ motor area 4, premotor area 6, 4 S >>>>CORONA RADIATA>>>>INTERNAL CAPSULE>>>>BASAL GANGLA>>BRAIN STEM >>>BULBOSPINAL TRACTS descend to spinal cord :-

A- Rubrospinal tract. B- Vestibulospinal Tract. C- Reticulospinal Tract
D- Tectspinal Tract. E- Olivospinal Tract

Extrapyramidal system:

(1) Sets the postural background needed for performance of skilled movements .

(2) Controls subconscious gross movements.

Team Notes :

because it stops at the brain stem and continues to the =bulbospinal spinal cord

movements large nonthinking =subconscious gross

wearing clothes without thinking how ،g walking.e

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Slide No.(11)

1-rubrospinaltract:

(INHIBITORY):-

-From Red nucleus which is connected by fibers with cerebral cortex. Its motor function is inhibitory to Distal limb motor neurons & control skilled movements

2- Vestibulospinal tracts:-

-From vestibular nucleus. Fibers originate in vestibular nuclei in pons(which receive inputs from inner ear Vestibular Apparatus and cerebellum)

-Axons descend in the ipsilateral ventral white column of spinal cord

-Functions:-

1- Controls Postural & righting reflexes.

2-Excitatory to ipsilateral spinal motor neurons-that supply axial & postural muscles

3- Control eye movements.

Team Notes :

Rubro=red

Red nucleus is in the brain stem

Rubrospinal tract helps in balance since it is inhibitory, it opposes the lateral corticospinal tract. It controls skeletal muscles by inhibition.

The doctor said it is not important to know the crossing of extrapyramidal tract.

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Slide No.(12)

Functions of Vestibulospinal Tracts:

• The lateral vestibulospinal • Cells of origin : Lateral Vestibular Nucleus • Axons descend in the ipsilateral ventral white column of spinal cord . • This tract mediates excitatory influences upon extensor motor neurones to maintain posture (of the same side)

• The medial vestibulospinal tract : • Cells of origin : Medial Vestibular Nucleus • As its axons descend ipsilaterally in the ventral white column of spinal cord , they form part of the Medial Longitudinal Fasciculus fibers that link vestibular nuclei to nuclei supplying the extraocular muscles for coordination of head and eye movements

Team Notes :

medial vestibulospinal tract stops at the brain stem before entering MLF that's why it helps in head and eye movement

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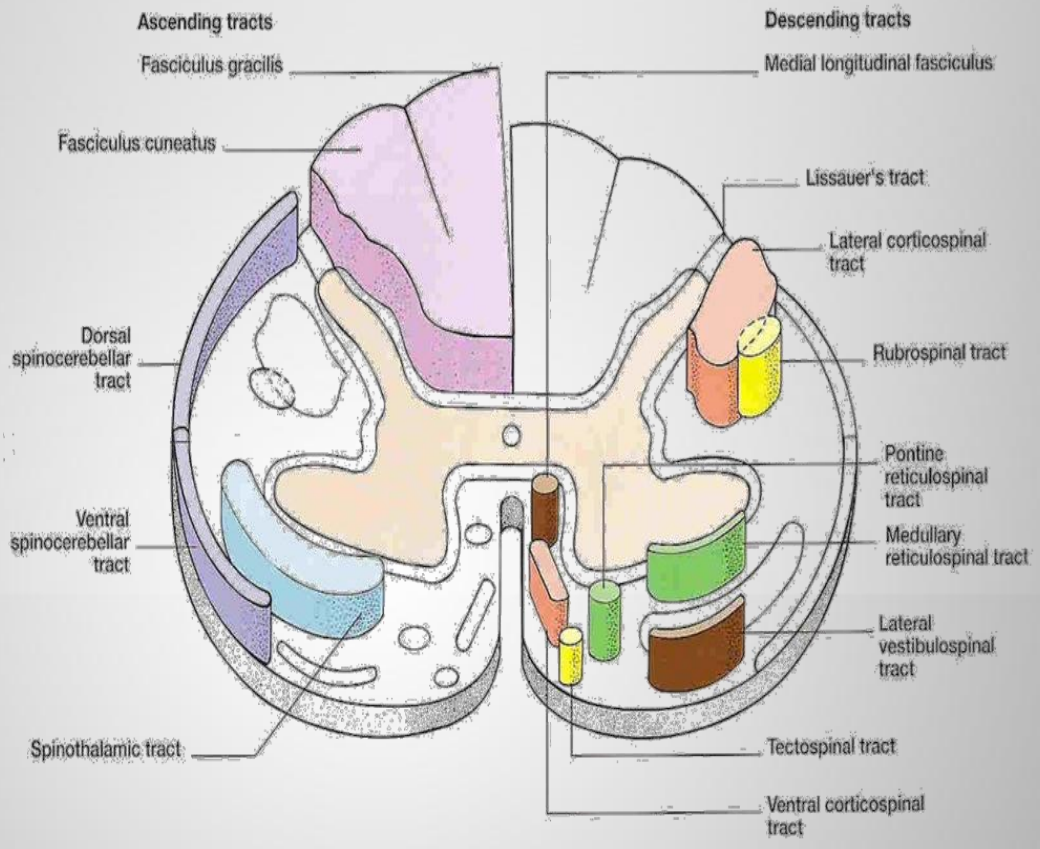
Slide No.(14)



Team Notes :

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Slide No.(14)

3-Tectospinat tracts: -

-From superior(VISUAL)& inferior colliculi (AUDITORY)of midbrain

- Ends on Contralateral cervical motor neurons

Function: Mediate/facilitate turning of the head in response to visual or Auditory stimuli

Team Notes :

tectospinal=from superior and inferior tectums fo brain stem to spinal cord

contralateral=opposite side

examples:

When seeing a car coming fast or hearing a lion roar, you jump away.

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Slide No.(15)

4- Reticulospinal Tract: - -

The reticular formation makes up a central core of the brainstem. It contains many different neuronal groups. -Pontine and medullary nuclei projects to the anterior horn of the spinal cord via Reticulospinal Tract

Functions: 1-influence motor functions as voluntary & reflex movement 2-excitatory or inhibitory to muscle tone

Team Notes :

Reticular formation=the substance inside the brain stem (neurons)

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Slide No.(16)

Reticulospinal tract divisions

(1) Pontine (Medial) Reticulospinal Tract:

• Cells of origin: Pontine Reticular Formation

• Axons descend in ventral white column of spinal cord

• Axons terminate in ipsilateral spinal motor neurons

• Pontine Reticulospinal Tract increases Gamma efferent activity ,(excitatory = increases muscle tone)

(1) Medullary (Lateral) Reticulospinal Tract:

• Cells of origin: Medullary Reticular Formation

• Axons descend in ventral white column of spinal cord on both sides

• Axons terminate in ipsilateral & contralateral ventral horn cells of spinal cord • Medullary Reticulospinal Tract, inhibits Gamma efferent activity (inhibitory= decreases muscle tone).

Team Notes :

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5-Olivospinal Tract :- It arises from inferior olivary nucleus of the medulla & is found only in the cervical region of the spinal cord (supply neck muscles) of unknown function

Team Notes :

summery

Medullary reticulospinal tract and rubrospinal tract are inhibitory

Pontine reticulospinal tract and vestibulospinal tract are excitatory