جامعة الملك سعود
King Saud University

MED437

4th Lecture |The Physiology Team

physiology of motor tract

Objectives :

- What is upper motor neuron and lower motor neuron
- The main differences between the pyramidal and extrapyramidal systems.
- Explain the origin, course and functions of the following motor tracts; (Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal)

Done by:

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Colour index :
- important
- Numbers
- Extra

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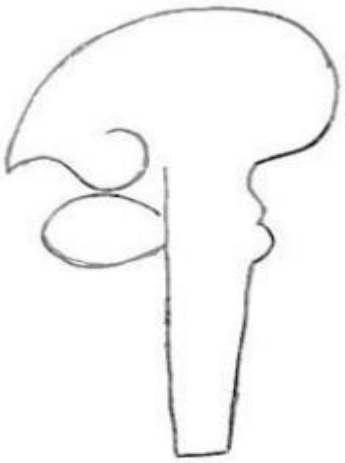


Motor system & descending tracts part 1

Descending tracts are bundles of axons that transmit information from higher centres (e.g cortex).
They may target skeletal muscles (voluntary motor response) or may target gland,heart and viscera (autonomic nervous system).

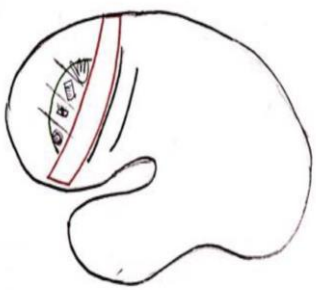
Motor area is anterior to central sulcus and sensory area is posterior to it.
There is two tools they used to determine the activity in the cerebral cortex:

1. electrical stimulation by an electrode
2. neurological deficits produced by destructive lesion.

There are three motor areas

-1Primary motor cortex

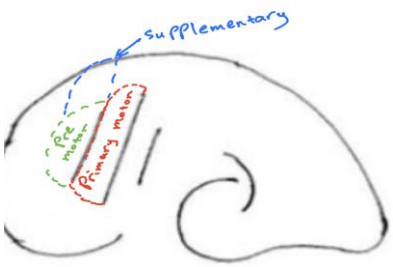
is the precentral gyrus present on the superolateral surface in front of the central sulcus and its extension medialy on the cerebral hemisphere .



-2Premotor area

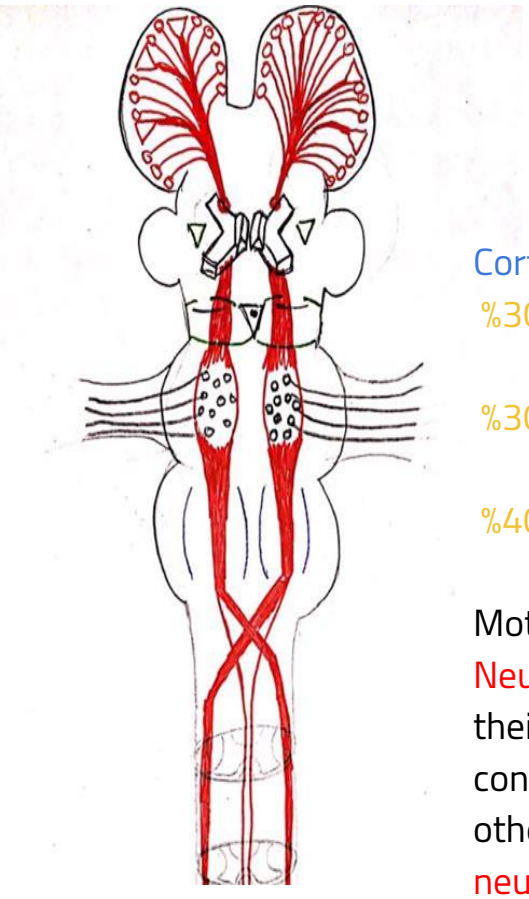
plans the motor activity, and it doesn't have a direct connection with muscles, it has some specific areas such as:

A. **Broca's area that control talking**
B. **Frontal eye field** located above Broca's area in the frontal lobe, it is concerned with eye movement if it got irritated/stimulated your eyes will be looking in the other direction but if it got destroyed (e.g tumor) eyes will be toward the lesion
C. **Head rotation area**
D. **Skilled hand movements**



-3Supplementary motor area

plans very primitive movement bilaterally
The primary motor neuron cannot plan themselves they have to be orchestrated by the premotor cortex
Proprioception in unconscious level will be controlled by cerebellum and in conscious level the



Motor system & descending tracts part 2

Corticospinal tract fibers start from:

%30 from primary motor area

%30 from premotor and supplementary area

%40 sensory cortex

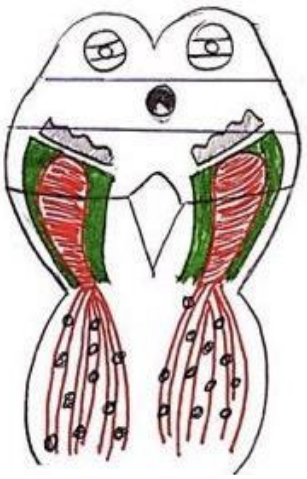
Motor cortex has six layers of neurons.

Neurons of Betz are very large cell body neurons and their axons are very heavily myelinated and thick it connects directly to the lower motor neuron unlike other cells will connect with interneurons (internuncial neurons) only found in primary motor cortex.

All the the nerve fibers will be compacted in the posterior limb of internal capsule .

The artery which supplying the posterior limb of internal capsule (lenticulo striate artery) gets blocked in old age then many fibers will be destroyed,that is equivalent to destroying all the cerebral cortex and all movement in the contralateral body will be disturbed (hemiplegia) but if the lesion is above so not all fibers are destroyed the muscle become weak (hemiparesis)

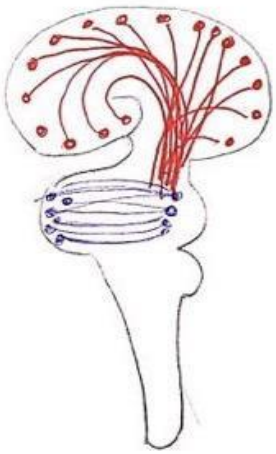
MIN.22



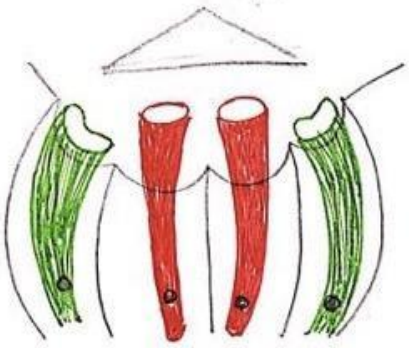
Motor system & descending tracts part 2

-**Parkinson's disease** eht yb desuac si .argin aitnatsbuS fo egamad

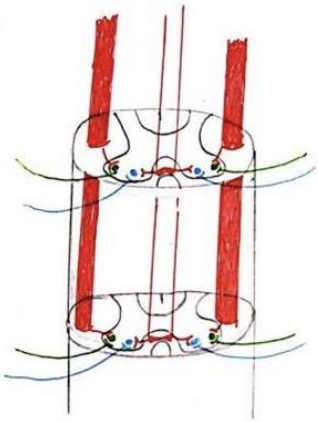
-Superior colliculus its concerned with eye movement and reflexes (that's why we drew the eyes) MIN30



Many fibers extend from the cerebral cortex and end up in pontine nuclei these are called corticopontine fibers then it goes to the cerebellum.
When the corticospinal fibers reach the pons it will be scattered by pontine nuclei and pontocerebellar fibers, so now when there is a lesion it will make a little damage. MIN34

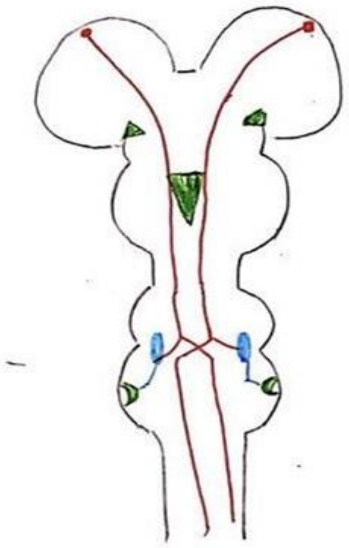


Corticospinal tract are also called "pyramidal tract."
Most of the Corticospinal fibers will decussate in the junction of medulla and spinal cord, if the damage is above it contralateral side will be losing the motor control but if it after it will be ipsilateral side .



Lateral corticospinal tract	Anterior corticospinal tract
important in fine hand movements.	concerned with axial movements

Motor system & descending tracts part3



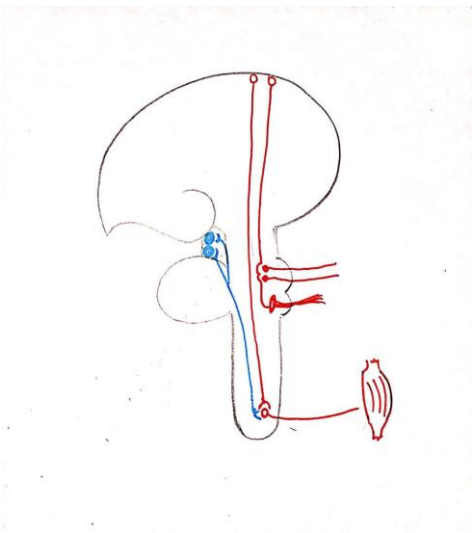
Motor neurons type:

-1Lower Motor neuron

that is come from CNS to the neuromuscular junction .

-2Upper motor neuron

all upper level of CNS neuron come from the upper and modifying the activity of Lower motor neuron and divide into :



cortical origin (pyramidal tract):

-Corticospinal tract (connect cortex to Lower motor fiber)

-Corticonuclear fiber (connect cortex to nucleus in brain stem)

a- corticomedullary /corticobulbar

b- corticopontine

c- cortico cephalic tract

subcortical (extrapyramidal tract) :

A- Tectospinal tract

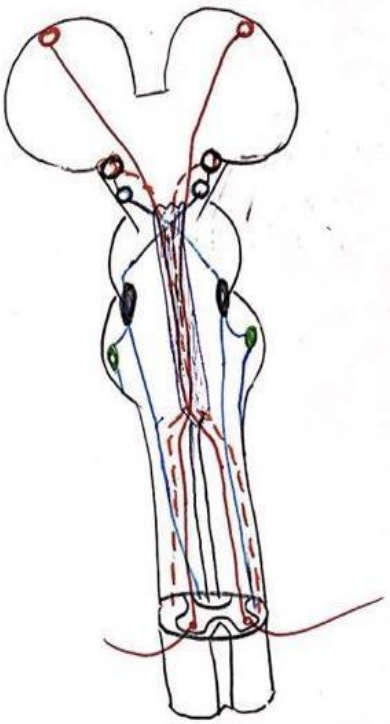
B- Rubrospinal tract

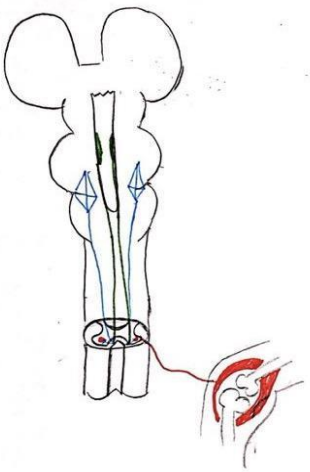
C- Reticular spinal

D- Vestibular spinal tract

E- Olivo spinal tract

Motor system & descending tracts part 3





When you wake up you are using extensor muscle because they are anti-gravity muscle
We have vestibular nuclear complex the fibers reach anterior column to increase tone of the extensor muscle
In the reticular formation have (ponto reticulospinal tract) act as vestibular nuclear complex
*but the master is vestibular spinal tract
When someone is VIP you stand up right ?
To make it easier to remember V= is stand to vestibular nuclear complex & p= ponto reticulospinal tract
Know when you sit down we use the word *
Sit in rubber mat to remember it : sit down > 2 tracts
-1Rubrospinal tract is mainly for flexor muscles help in initiation of voluntary movement
-2medullary reticular-spinal

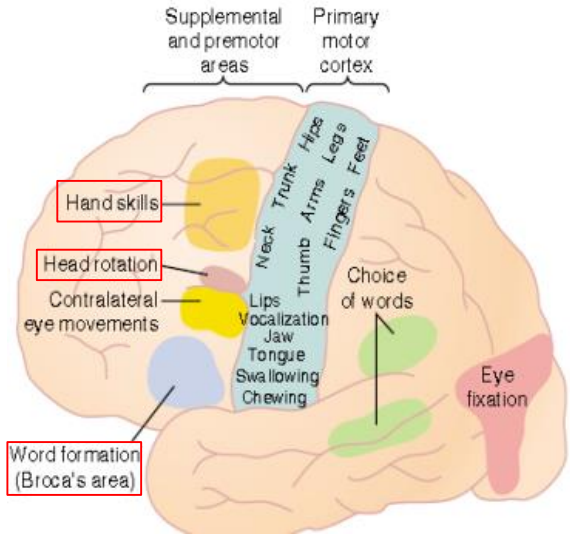
The main differences between the pyramidal and extrapyramidal systems.

A few highly specialized motor centers have been found in the premotor areas of the human cerebral cortex:

Premotor Area	Location:	Function:
Broca's Area for speech	Broca's Area	Speech
Frontal Eye Movements Area	Above Broca's area in the frontal lobe	Controls voluntary movements of the eye
Head Rotation Area	Just above the eye movement area in the motor cortex	Directing the head toward different visual objects
Hand Skills Area	*Above the head rotation area*	*Hand skills*

(3The Supplementary Motor Area:

- Located on the lateral side of the brain in front of area 4 and above the premotor area & extends on the medial side of the cerebral hemisphere.
- Concerned with planning & programming motor sequences
  - Simulation of this area leads to bilateral (bimanual) grasping movements of both hands simultaneously.



- This area make motor programs for * axial muscles. It provides background adjustment for finer motor control of the arms and the hands by the premotor area and primary motor cortex.

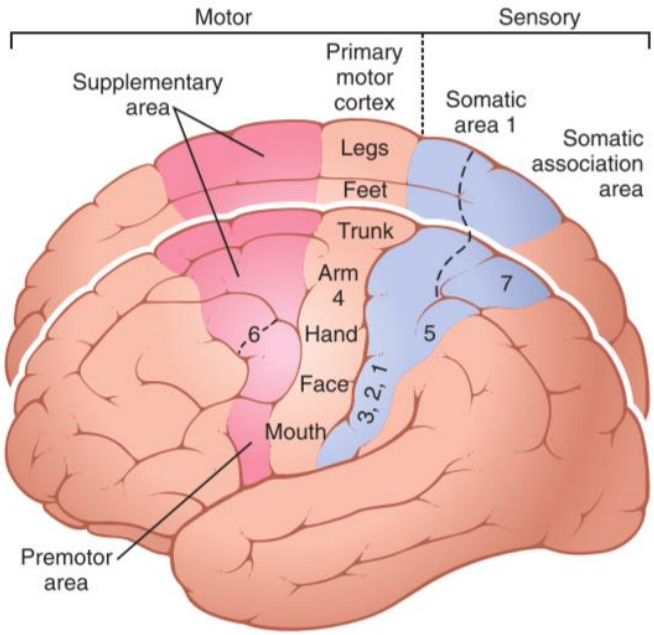
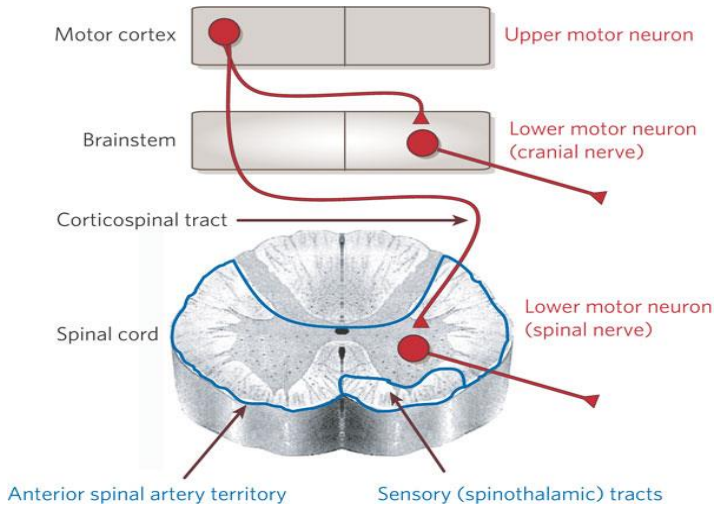


Figure 56-1. Motor and somatosensory functional areas of the cerebral cortex. The numbers *4, 5, 6,* and *7* are Brodmann's cortical areas, as explained in Chapter 48.

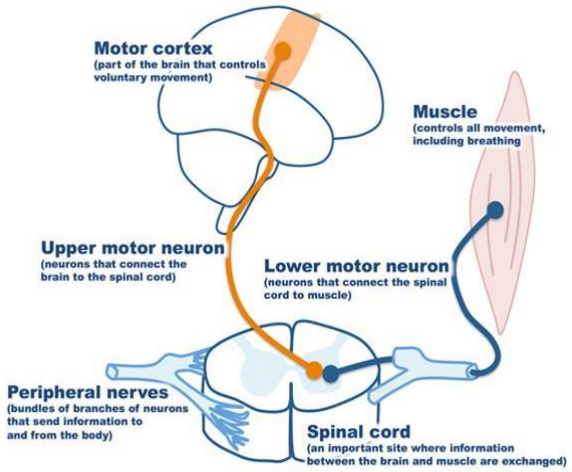
In order to initiate any type of **voluntary movement**2 eb lliw ereht levels of neuron that your body will use
and they are:

- 1Upper motor neurons (UMN)
- 2Lower motor neurons: (LMN)



-Upper motor neurons (UMN)
These are the motor neurons whose cell bodies lie in the motor cortex, or brainstem, and they activate the lower motor neuron

-Lower motor neurons: (LMN)
These are the motor neurons of the spinal cord (AHCs) and brain stem motor nuclei of the cranial nerves that innervates skeletal muscle directly.



Classification of descending motor systems:

-pyramidal :
originates from the cerebral cortex and descends to the spinal cord (the corticospinal tract) passes through the pyramids of the medulla and therefore has been called the "the pyramidal tract."

-extrapyramidal:
The rest of the descending motor pathways do not travel through the medullary pyramids, and are therefore collectively gathered under the heading: "the extrapyramidal tracts."
-Responsible for subconscious gross movements(swinging of arms during walking)

The main differences between the pyramidal and extrapyramidal systems.

The **descending motor system (*pyramidal, Extrapyramidal*)** has a number of important sets these are named according to the origin of their cell bodies and their final destination;

pyramidal

- **Corticospinal tract**
- **Corticobulbar tract**

Extrapyramidal

- **Rubrospinal tract**
- **Olivspinal tract**
- **Vestibulospinal tracts**
- **Reticulospinal tracts**
- **Tectospinal tract**

-1Corticospinal (pyramidal tracts) & corticobulbar tracts

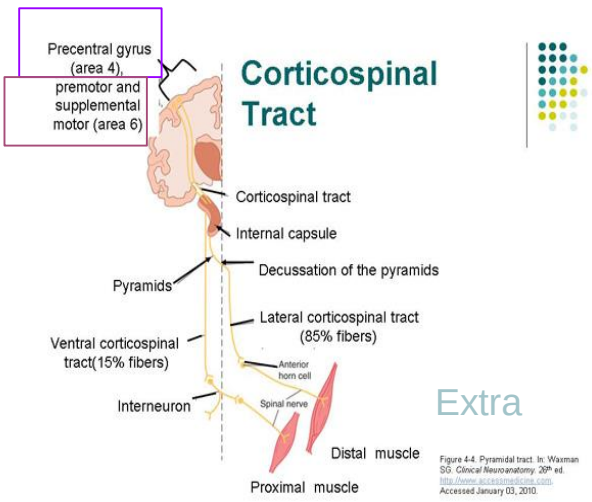


Figure 4-4. Pyramidal tract. In: Waxman SG. *Clinical Neuroanatomy*. 26th ed. http://www.accessmedicine.com. Accessed January 03, 2010.

Extra

Origin

%30 -1motor area yramirp eht)4 eht seipucco (1M) .(aera rotom suryg lartnecerp

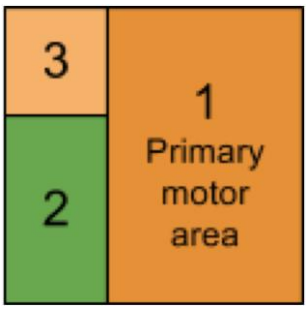
%30 -2from the premotor areas & supplementary cortex

What is Premotor area?

: ni seil (aera noitaicossa rotom) front of the primary motor area & below supplementary motor area .
Its stimulation produces complex coordinated movements, such as:
setting the body in a certain posture
to perform a specific task .

Supplementary cortex :

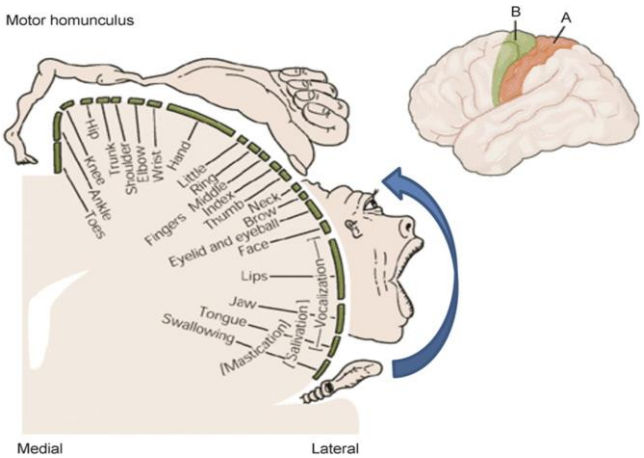
located on the lateral side of the brain in front of area 4 and above the pre-motor area:
extends on medial side of the cerebral hemisphere.
▪Concerned with planning and programming motor sequences.
%40 -3 ▪parietal cortex (somatic sensory area (3,1,2

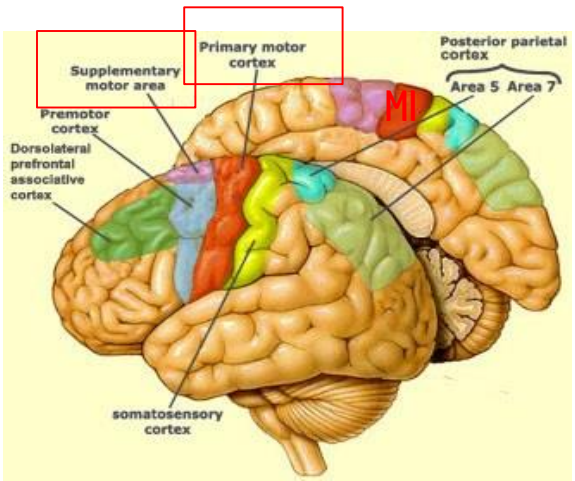


Motor Areas:

1) The Primary Motor Area (MI. Motor Area (4

- Occupies the Precentral Gyrus & contains large, giant highly excitable **zteB .sllec**
- MI of one side controls skeletal muscles of the opposite side of the body.
- Facial area is represented bilaterally, but rest of the representation is generally unilateral
- Area of representation is proportional with the complexity of function done by the muscles. Therefore muscles of the hands & speech occupy 50% of this area.
- The neurons of this area are arranged in vertical columns, each column has **6** distinct layers of cells, the pyramidal cells that give rise to the corticospinal fibers all lie in the **5th** layer.
- %3of the pyramidal fibres are large myelinated, derived from giant, highly excitable pyramidal
- Betz cells in motor area .4
- The Betz cells fibers transmit nerve impulses to the spinal cord at a velocity of ~70m/s, the most rapid rate of transmission of signals from the brain to the cord.
- Betz cells axons send short collaterals back to the cortex to inhibit adjacent regions of the cortex when the Betz cells discharge, thereby **"sharpening"** the excitatory signal.





(2 The Premotor Area (Area (6

- Lies in front of the primary motor area & below supplementary motor area.
- Simulation of the premotor area produces complex coordinated movements, such as setting the body in a certain posture to perform a specific task. *Example: when writing, your body sits in a specific posture to aid. + playing piano*
- It works in association with the supplementary motor area, establishing the motor programs necessary for execution of complex movements.

Explain the origin, course and functions of the following motor tracts;
)Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal(

Corticospinal (Pyramidal Tracts) & Corticobulbar Tracts

Knowing the distribution of the tracts is **important**

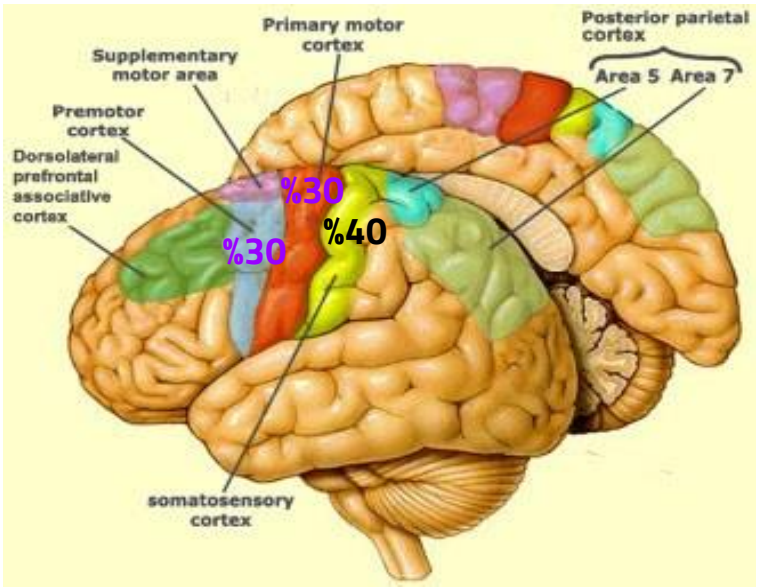
Origin:

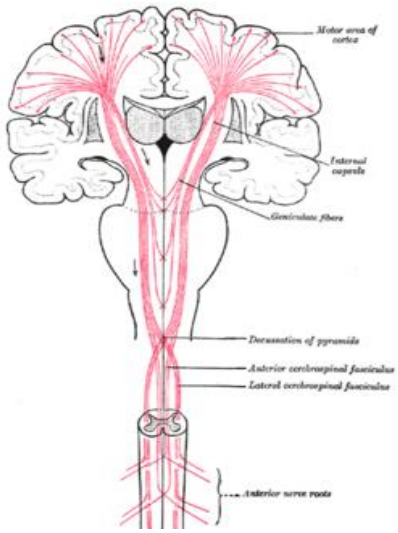
- %30Motor area (1M) (aera rotom yramirP)4
- %30Premotor areas & supplementary cortex
- %40Parietal cortex (Somatic sensory area (3,1,2

%3 - of the fibres are large myelinated fibres, derived from the large , highly excitable pyramidal Betz cells of M citpanysonom mrof srebif esehT .1 .droc lanips eht fo snoruen rotom htiw snoitcennoc

يشبه شعاع الشمس

Fibers from the cerebral cortex descend in ***Corona Radiata** ot **Internal Capsule Genu** ot neht ,bmil roiretsop eht fo ⅔ roiretna eht dna ,**Brain Stem** .(atagnolbO alludeM ,snoP ,niarbdiM)*





In the Brainstem :(atagnolbO alludeM ,snoP ,niarbdiM)

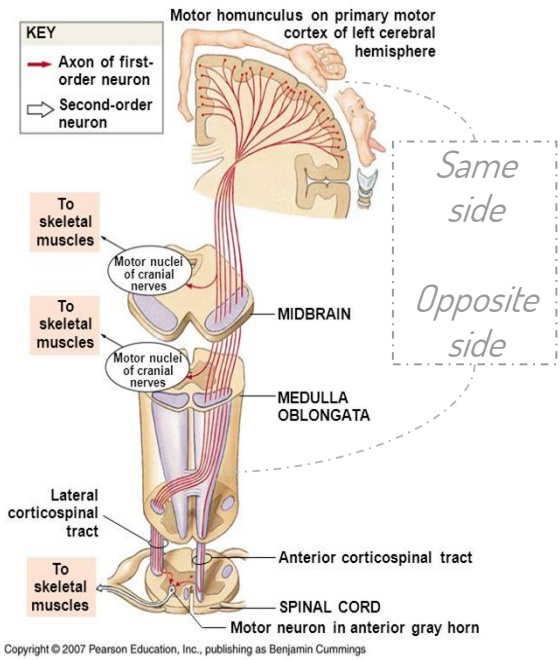
1. **Corticobulbar tract**

   carries information to motor neurons of the cranial nerve

)terminates on cranial nerve nuclei of opposite side(
) decussating just before they reach their target nuclei(

1. **Corticospinal tracts (Pyramidal)**

   Descends through the midbrain and pons, Then in the lower medulla oblongata the fibers form pyramids so called pyramidal tract



Explain the origin, course and functions of the following motor tracts;
)Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal(

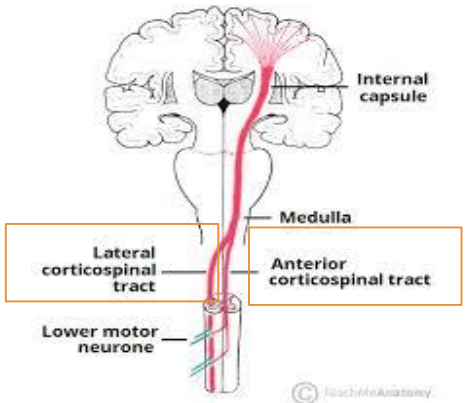
Corticospinal tracts (Pyramidal)divides into:

-1lateral corticospinal tracts:

%80 -of fibers
-cross midline in pyramids
-Pass laterally in spinal cord white matter
-Ends directly (not via interneurons = monosynaptic connections) on motor neurons (AHCs) of the opposite side here the lower motor neurons (LMNs) of the corticospinal cord are located .
-Then peripheral motor nerves carry the motor impulses from the anterior horn to the voluntary muscles
-The fibers pass laterally in spinal cord white matter, so they control distal limb muscles
Function//- controls and initiates fine discrete skilled movements of fingers and toes.

-2Ventral (anterior) corticospinal tracts :

-Remaining 20% fibers does not cross midline
-Cross at level of their termination to synapse with interneurons , that synapse with motor neurons (AHCs) of opposite side .
-Pass medially in ventral horn so control axial & proximal limb muscles .
So corticospinal tract(ANT& LAT) supply skeletal muscles of the opposite side
- *These fibers control the axial and proximal limbs muscles so it concern with control of posture.*



Origin –Sensory cortex, primary Motor Cortex, premotor & supplementary cortex

Internal capsule

Cerebral Peduncle (midbrain)

pons

Medullary Pyramid

Pyramidal Decussation

Lat.Cross & Vent. Uncross White matter in spinal cord

Lat.Cross & Vent. Uncross White matter in spinal cord

Ant. Horn of spinal cord through a interconnection

edis etisoppo fo noruen rotom α

Explain the origin, course and functions of the following motor tracts;
)Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal(

-Functions of corticospinal tracts-:
-1Initiation of fine ,discrete, skilled voluntary movements
)on which side(?

-2lateral corticospinal tracts (main bulk of the tract) control distal muscles of limb as fingers & thumb & toes which concerned with fine skilled movement) e.g Painting ,writing, picking up of a small object etc.
-3Ventral corticospinal tracts control posture of axial & proximal limb muscle for balance, climbing, walking
-4Effect on stretch reflex-:
-Facilitate muscle tone through gamma motor neurons
-5Fibers originate from parietal lobe are for sensory-motor coordination
-6Corticobulbar tracts control face & neck muscles (+eye) & facilitate their tone, and are involved in facial expression mastication and swallowing.

Excitation of the Spinal Cord Motor Control Areas by the Primary Motor Cortex and Red Nucleus
-Vertical Columnar Arrangement of the Neurons in the Motor Cortex.
-Function of Each Column of Neurons:
-Each column has six distinct layers of cells, The pyramidal cells that give rise to the corticospinal fibers all lie in the fifth layer of the cortical surface.
-Function of Each Column of Neurons;
-Each column of cells functions as a unit & as integrative processing system, using information from multiple inputs to determine the output response from the column.
-Each column can function as an Amplifying system to stimulate large numbers of pyramidal fibers to the same muscle or to synergistic muscles simultaneously.
-Dynamic and Static Signals Transmitted by the Pyramidal Neurons;.
Each column of cells excites two types of pyramidal cell neurons;
-1The dynamic neurons are excited at a high rate for a short period at the beginning of a contraction, causing the initial rapid development of contraction.**(noitca eht trats)**
-2The static neurons fire at a much slower rate, but continue firing at this slow rate to maintain the force of contraction as long as the contraction is required.
-The neurons of the red nucleus have similar dynamic and static characteristics,
-Greater percentage of dynamic neurons is in the red nucleus and a greater percentage of static neurons is in the primary motor cortex.

Explain the origin, course and functions of the following motor tracts; (Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal)

Removal of (Area Pyramidalis) of the Primary Motor Cortex

-Removal of a the area that contains the giant Betz pyramidal cells (Area Pyramidalis) causes loss of voluntary control of discrete movements of the distal segments of the limbs, especially of the hands and fingers (This does not mean that the hand and finger muscles themselves cannot contract (paralysis) rather, the ability to control the fine movements is gone) .

-That is because area pyramidalis is essential for voluntary initiation of finely controlled movements, especially of the hands and fingers

Extrapyramidal tracts-:

Tracts other than corticospinal tract & are outside pyramids

Origin/ motor area 4 aera rosserppuS ,6 aera rotomer ➡ 4CORONA RADIATA to ➡ INTERNAL CAPSULE to ➡ BASAL GANGLIA to BRAIN STEM ➡ BULBOSPINAL TRACTS descend to spinal cord as:

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

-Extrapyramidal system:

-1sets the postural background needed for performance of skilled movements .

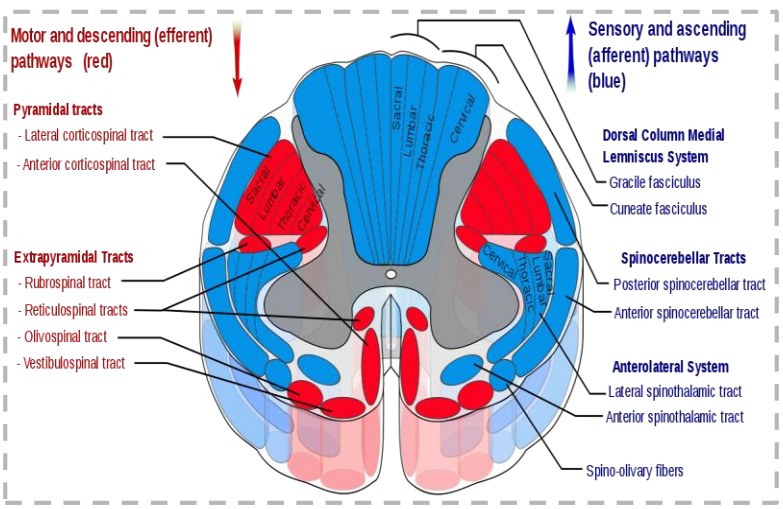
-2controls subconscious gross movements.

Effects of Lesions in the Motor Cortex or in the Corticospinal Pathway(The stroke):

-The motor control system can be damaged by the "stroke"

-Muscle Spasticity Caused by Lesions That Damage Large Areas Adjacent to the Motor Cortex.

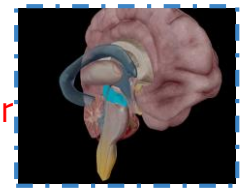
-Most lesions of the motor cortex, especially those caused by a stroke, involve the primary motor cortex & adjacent parts of the brain such as the basal ganglia .



Explain the origin, course and functions of the following motor tracts;
)Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal(

-1Rubrospinal tracts:

Remember that nucleus is a collection of cell body with in CNS
If it was in peripheral Nerves system it will be a ganglia



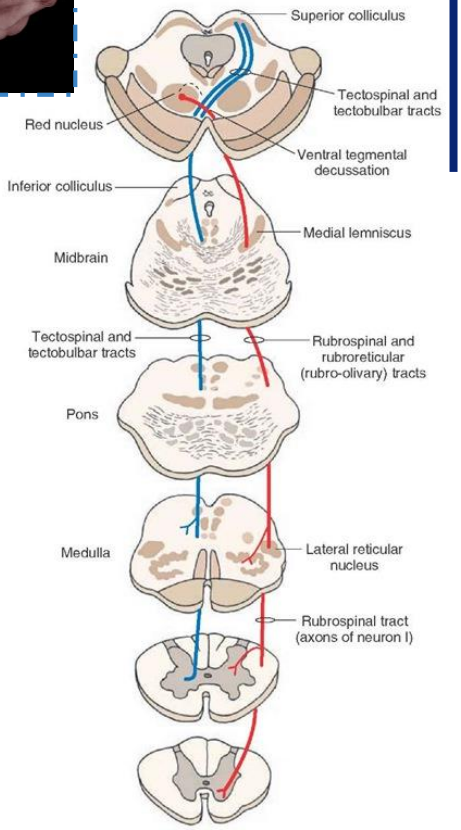
-The red nucleus located in the mesencephalon (in the pic).

-Ipsilateral cortical motor area (corticobulbar pathway)

-It receives direct fibers from the primary motor cortex through the corticorubral tract & some branching fibers from the corticospinal tract (These fibers synapse in the lower portion of the red nucleus, the magnocellular portion)

-The rubrospinal tract, which crosses to the opposite side in the lower brain stem into the lateral columns of the spinal cord together with corticospinal tract

-The rubrospinal fibers terminate mostly on interneurons of the cord gray matter, along with the corticospinal fibers, but some of the rubrospinal fibers terminate directly on anterior motor neurons



Function of the Corticorubrospinal System: ereht eht fi staht lanipsocitroc sa emas sa) (noitcnuf eht od lliw siht tcart lanipsocitroc ni egamad a si

-The corticorubrospinal pathway serves as an accessory route for transmission of discrete signals from the motor cortex to the spinal cord. When the corticospinal fibers are destroyed, discrete fine control of the fingers movements can still occur but impaired..

-This tract is excitatory for flexors & inhibitory for extensors (anti-gravity muscles).

-Rubrospinal tract lies in the lateral columns of the spinal cord, along with the corticospinal tract. Therefore, together are called the lateral motor system of the cord, in contradistinction to a vestibulo-reticulospinal system, which lies mainly medially in the cord and is called the medial motor system of the cord

Explain the origin, course and functions of the following motor tracts;
)Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal(

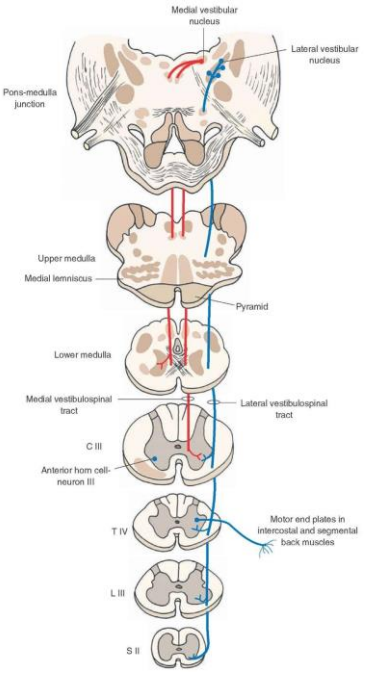
-2Vestibulospinal tracts:

-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

-General Functions -:

1. Controls Postural & righting reflexes .
2. Excitatory to ipsilateral spinal motor neurons-that supply axial & postural muscles
3. Control eye movements



Functions of Vestibulospinal Tracts :

A- The lateral vestibulospinal

- Cells of origin: Lateral Vestibular Nucleus
- Axons descend in the ventral white column of the spinal cord
- This tract mediates excitatory influences upon extensor motor neurons to maintain posture & righting reflexes

B- The medial vestibulospinal tract:

- Cells of origin: Medial Vestibular Nucleus
- As its axons descend in the ventral white column of spinal cord to end at the cervical segments of the spinal cord, some fibers form part of the Medial Longitudinal Fasciculus fibers in brain stem that link vestibular nuclei to nuclei supplying the extraocular muscles
  (تتحكم بالعين بدل ما كل عين تتحرك لحالها)
- Function: for coordination of head and eye movements

Role of the vestibular nuclei to excite the Antigravity muscles:

-The vestibular nuclei, function in association with the pontine reticular nuclei to control the antigravity muscles.

-The vestibular nuclei transmit excitatory signals to the antigravity muscles by way of the lateral and medial vestibulospinal tracts

-Without this support of the vestibular nuclei, the pontine reticular system would lose much of its excitation of the axial antigravity muscles.

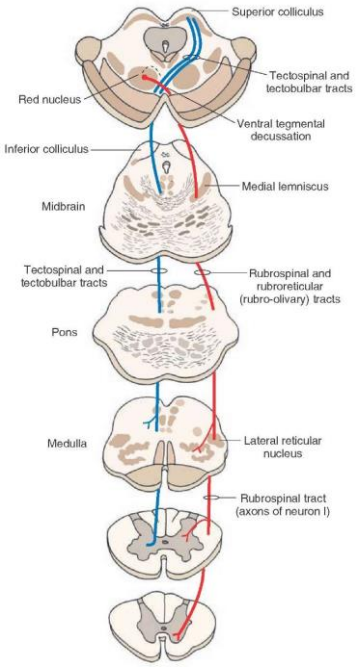
Explain the origin, course and functions of the following motor tracts;
)Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal(

-3Tectospinal tracts:

-From superior colliculi in the tectum of midbrain (for VISUAL reflexes) & from inferior colliculi of midbrain (for AUDITORY reflexes)

-Ends on Contralateral cervical motor neurons (that's why it supply the head and neck)

Function: Mediate/facilitate turning of the head and neck in response to visual or Auditory stimuli eht) (sulumits eht drawot eb lliw esnopser



-4Reticulospinal Tract:

-Tract arises from The reticular formation which makes up a central core of the brainstem

-It contains sensory & motor neuronal groups

-Pontine and medullary nuclei project to the AHC of the spinal cord via Reticulospinal Tract

Types of reticulospinal tracts-:

.1Pontine (Medial) Reticulospinal Tract:

- Cells of origin: Pontine Reticular Formation which has high excitability & they receive strong excitatory signals from the vestibular nuclei.
- Axons descend in anterior(ventral)white column of spinal cord
- Pontine Reticulospinal Tract increases Gamma efferent activity (excitatory to axial & antigravity, extensor muscles of the body & inhibitory for flexores & increases muscle tone)

-it causes powerful excitation of antigravity muscles

Explain the origin, course and functions of the following motor tracts;
)Corticospinal, tectospinal, rubrospinal, vestibulospinal, reticulospinal, olivospinal(

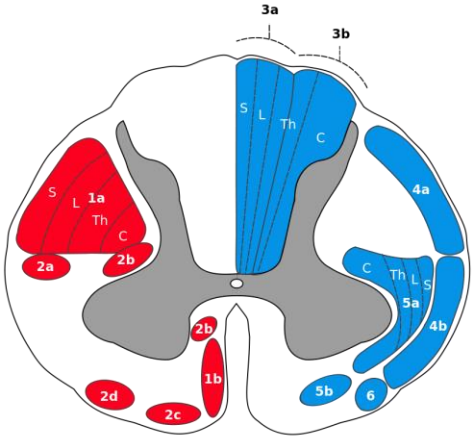
.2Medullary (Lateral) Reticulospinal Tract:

- Cells of origin: Medullary Reticular Formation
- Axons descend in lateral white column of spinal cord on both sides

-It receives strong input from
(1) the corticospinal tract
(2) the rubrospinal tract and
-These activate the medullary reticular inhibitory system to counterbalance the excitatory signals from the pontine reticular system,
-Medullary Reticulospinal Tract inhibits Gamma efferent activity
)transmit inhibitory signals to antigravity extensor muscles & decreases
muscle tone. (

-5Olivospinal tract:

-It arises from inferior olivary N of the medulla & is found only in the cervical region of the spinal cord (supplies neck muscles) of unknown function
-Secondary olivocerebellar fibers transmit signals to multiple areas of the cerebellum



Motor and decending (efferent) pathways (left, red)	Sensory and ascending (afferent) pathways (right, blue)
1. Pyramidal Tracts	**3. Dorsal Column Medial Lemniscus System**
1a. Lateral corticospinal tract	3a. Gracile fasciculus
1b. Anterior corticospinal tract	3b. Cuneate fasciculus
2. Extrapyramidal Tracts	**4. Spinocerebellar Tracts**
2a. Rubrospinal tract	4a. Posterior spinocerebellar tract
2b. Reticulospinal tract	4b. Anterior spinocerebellar tract
2c. Vestibulospinal tract	**5. Anterolateral System**
2d. Olivospinal tract	5a. Lateral spinothalamic tract
	5b. Anterior spinothalamic tract
Somatotopy Abbreviations:	
S: Sacral, **L: Lumbar**	6. Spino-olivary fibers
Th: Thoracic, **C: Cervical**	

Quick review

All extra pyrimidal tracts upper neurons emerge from?
subcortical areas

Theoretically, if we remove the primary motor cortex what will happen?
Hypotonia (due to loss of muscle tone). This doesn't normally happen.

What does occur is stroke which affects pyramidal fibers and extrapyramidal fibers which causes?
Hypertonia/spasticity, e.g. vestibular spinal tract and pontine reticulospinal tract which are excitatory for muscle tone are normally inhibited by another cortical area. When a stroke occurs the inhibitory area is damaged and tracts are free from inhibition. Most strokes occur in the internal capsule in which all fibers are close together so both Pyramidal and extrapyramidal tracts are usually affected together.

We must know the function of each tract:
Tectospinal tract:
tectospinal reflex

Pontine reticulospinal tract:
Stimulation of extensors and inhibition of flexors

Corticospinal spinal tract + medullary reticulospinal:
Stimulation of flexors inhibition of extensors

Excite Flexors	Excite Extensors
Lateral(medullary) Reticulospinal	Medial(pontine) Reticulospinal
Rubrospinal	Vestibulospinal

.1**where can we find betz cells?**

A. .primary area
B. .premotor area
C. .supplementary cortex
D. .somatic sensory area

.2**where can you find broca's area?**

A. .primary area
B. .premotor area
C. .supplementary cortex
D. .somatic sensory area

.3**what does broca's area do?**

A. .control walking
B. .control hearing
C. .control eye movement
D. .control speaking

.4**parkinson's disease is caused by a damage in?**

A. .tectospinal tract
B. .neuron of betz
C. .Substantia nigra.
D. .Superior colliculus

.5**if there is a nerve damage under the medulla then that damage will be?**

A. .contralateral
B. .ipsilateral
C. .answer A and B
D. .none

.6**where does Corticospinal originate from?**

A. %30.Motor area 4
B. %30.Premotor areas & supplementary cortex
C. %40.Parietal cortex (Somatic sensory area)
D. all of them

.7**which tract cross in the midbrain?**

A. .Corticobulbar tract
B. .lateral corticospinal tract
C. .corticospinal tract
D. .Ventral (anterior) corticospinal tract

.8**which tract descend with the lateral corticospinal tract?**

A. .Rubrospinal tracts
B. .Vestibulospinal tracts
C. .Tectospinal tracts:
D. .Reticulospinal Tract

.9**coordination of head and eye movements is function of?**

A. .medial vestibulospinal tract
B. .Pontine (Medial) Reticulospinal Trac
C. .Tectospinal tracts
D. .The lateral vestibulospinal

.10**what is the function of Pontine (Medial) Reticulospinal Tract?**

A. .inhibitory signals to antigravity extensor muscles & decreases muscle tone
B. .coordination of head and eye movements
C. .excitatory to axial & antigravity, extensor muscles of the body & inhibitory for flexores & increases muscle tone
D. excitatory for flexors & inhibitory for extensors

Answers:

.1A
.2B
.3D
.4C
.5B
.6D
.7B
.8A
.9A
.10C