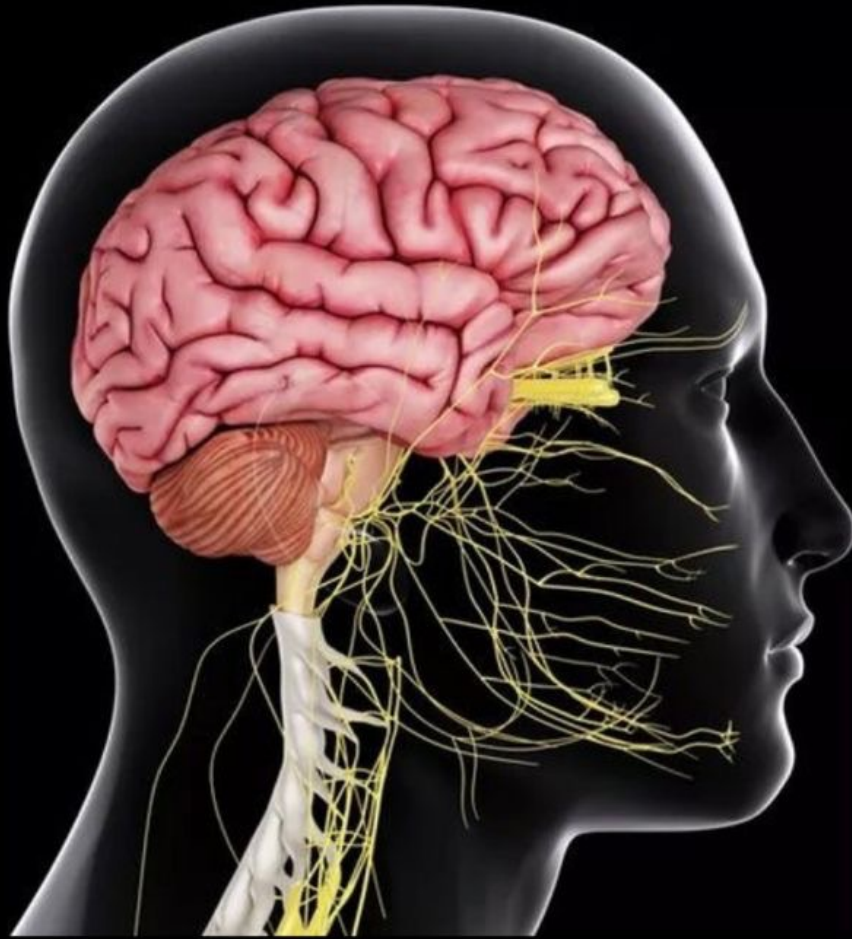




# CENTRAL NERVOUS SYSTEM



SUBJECT : Anatomy

LEC NO. : 4

DONE BY : Batool ALzubaidi & Hashem Ata

وَقُلْ رَبِّ زِدْنِي عِلْمًا

# Descending tracts

**Dr Ashraf Sadek** *PhD, MD, MRCPCH*

Assistant Professor of anatomy and  
embryology

ال descending يعني اشي نازل من فوق ل تحت يعني من  
 ال cortex او ما تحت ال cortex عشان تعمل motor action

# Descending Tracts

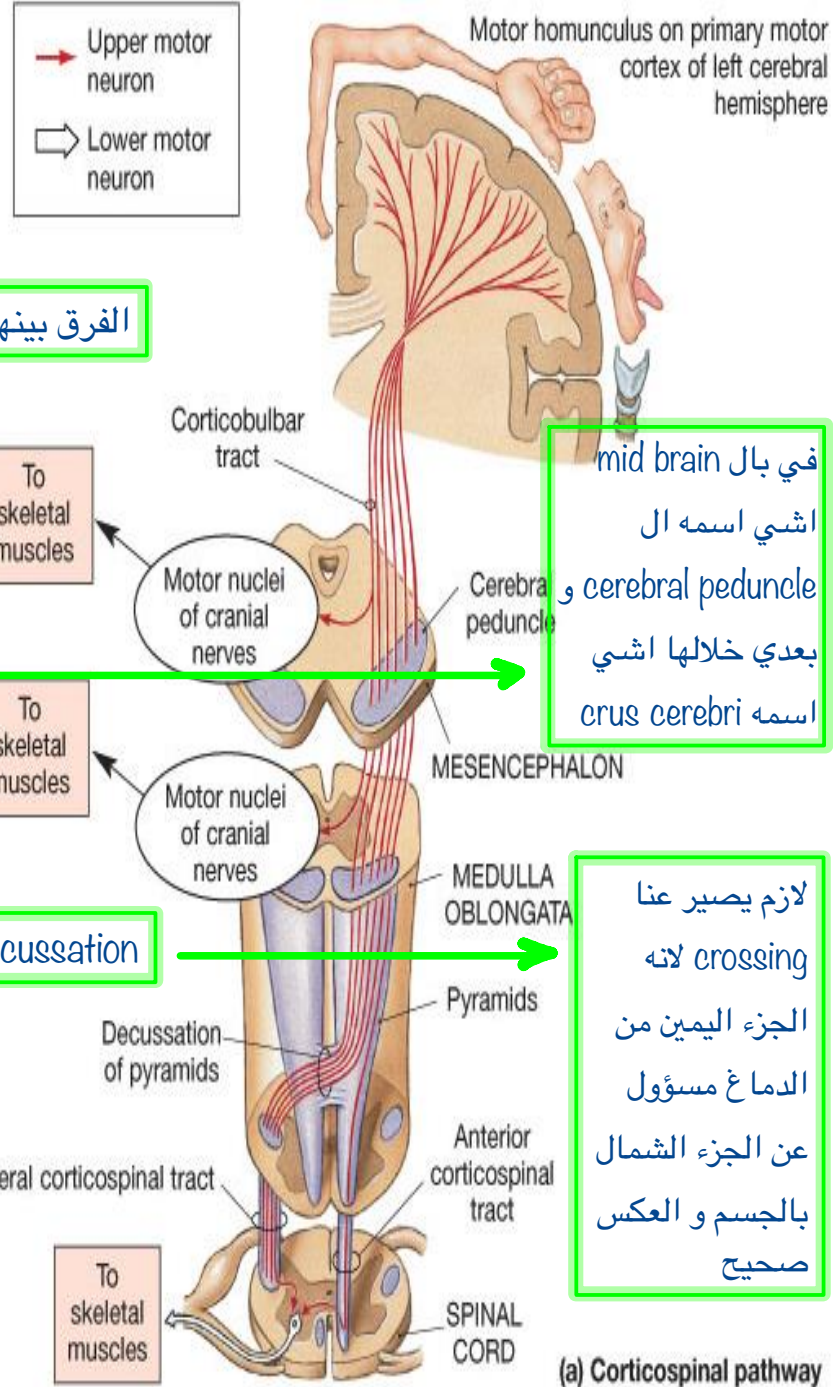
## Pyramidal tract

ال الفرق بينهم راح ناخده الاسبوع الجاي بمحاضرة ال cortex

- **Origin:** neurons of motor and premotor area  
 Responsible of voluntary and skills movements
- 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  
 يعني ال fibers بتكون متفرقة
- 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)

مسؤول عن ال trunk muscles

مسؤول عن اغلبية الحركات بالجسم عن ال limbs و الحركات الي بتتطلب skills

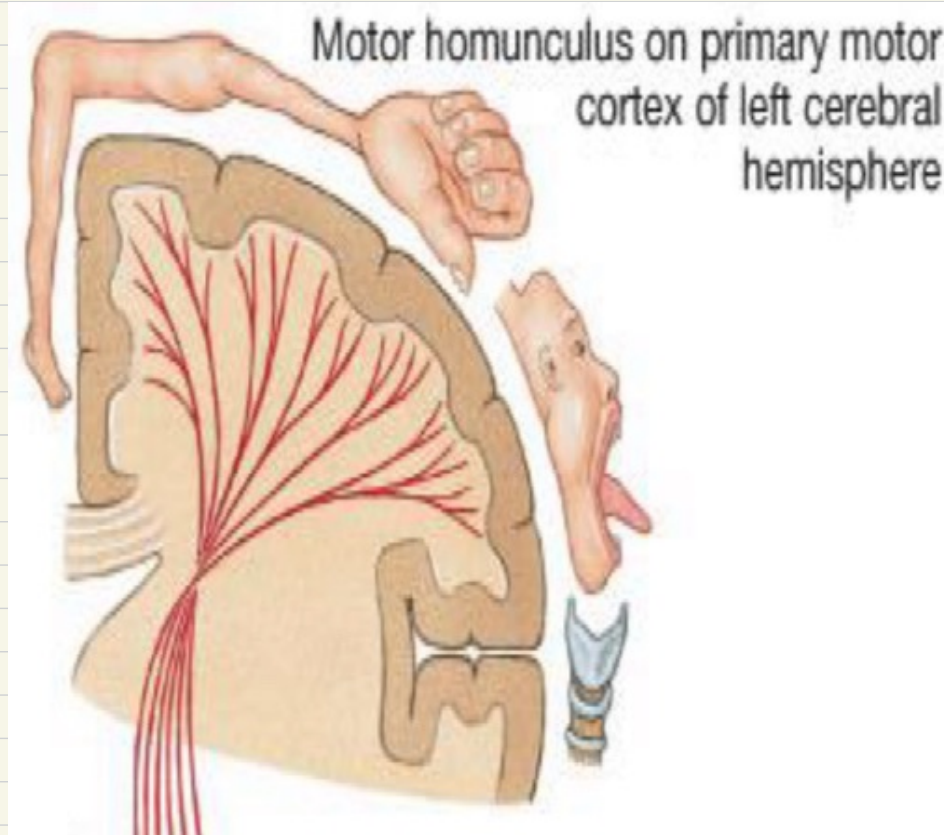


في بال mid brain  
 اشي اسمه ال cerebral peduncle  
 بعدي خلالها اشي اسمه crus cerebri

Motor decussation

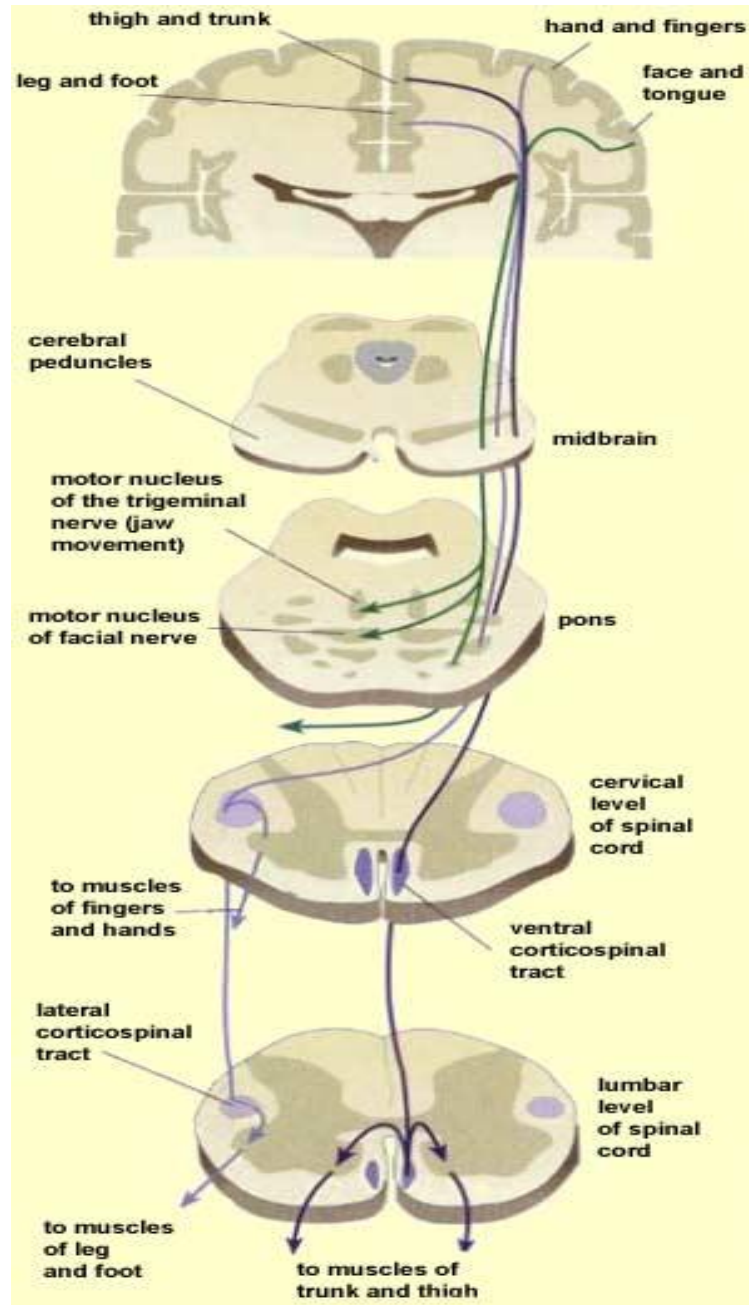
لازم يصير عنا crossing لانه الجزء اليمين من الدماغ مسؤول عن الجزء الشمال بالجسم و العكس صحيح

(a) Corticospinal pathway



ال cortex فيها زي الخارطة لجسم الانسان بكون حجمها متماشي مع حجم ال skills المطلوبة منا بهاد الجزء مثلا ال upper limb راح تلاقيها اكبر من ال lower limb ال thumb لحاله ماخذ مساحة كبيرة من ال upper limb لانه اكثر اشني بنعمله control

نفس الصورة نفس الكلام



## Lamination, Termination of pyramidal tract

### Lamination:

ال mouth and larynx تحت و ال limbs فوق

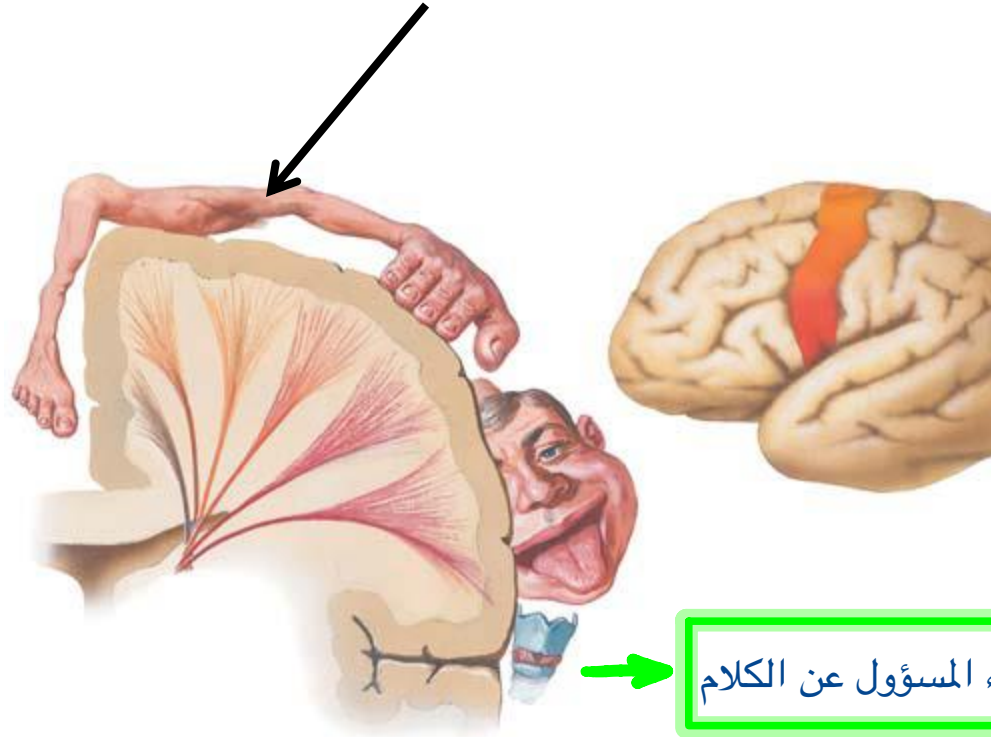
- in cerebral cortex body is presented up side down
- In internal capsule: upper limb anterior, lower limb posterior .
- In brainstem and spinal cord: cervical are medial and sacral are lateral

هاد ترتيب  
ال fibers و  
هي نازلة

### 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



الجزء المسؤول عن الكلام

# Cortico bulbar



حكيانا عن عضلات ال limbs and trunk طيب شو بالنسبة لعضلات ال head and neck؟  
 هدول ما بطلعوا من ال spinal nerves هدول بغذوهم ال cranial nerves  
 طيب هدول وين ال nuclei تااعتهم؟ وين ال anterior horn cells تعاونهم؟ ما الهم  
 anterior horn cells الخلايا المسؤولة عنها ال cells الموجودة بال brain stem

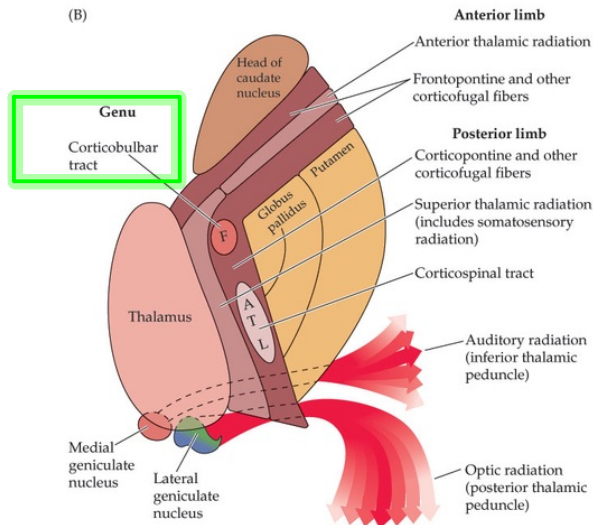
او cortico cranial لانها بتغذي ال cranial nerves

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

هاد الاشئي يعني انه صعب يجيلهم شلل لانه ال bilateral supply

- Facial nucleus that supplies muscle of lower part of face
- Hypoglossal nucleus that supplies genioglossus

Both receive contra lateral supply only



بصير نفس الاشئي ال fibers بتنزل من ال cortex بعدين بتروح لل internal capsule (الجزئية هاي راح تنشرح بالتفصيل)  
 المحاضرة الجاي بس هي بتعدي من ال genu of capsule الي هي ال angle تااعت حرف ال V الموجود بال capsule) بعدين بنزلوا بال brain stem يغذوا العضلات

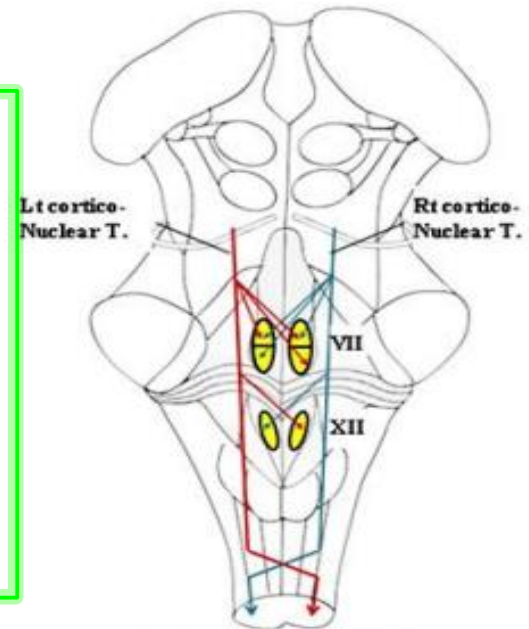


Figure 29: cortico-nuclear tract



Subcortical or from brain stem to the spinal cord » gross movement (position of the body, walking pattern) → doesn't need skills

احيانا ممكن ياخذ من cortical area  
رقم ٦ بس راح نحكي عنها لقدام

## 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

Rubro means red » named red nucleus situated in mid brain

➤ Tectospinal

في اشبي بال mid brain اسمه ال tectum و جواه في اشبي اسمه ال superior colliculus بتطلع منه

➤ Medial vestibulospinal

➤ Lateral vestibulospinal

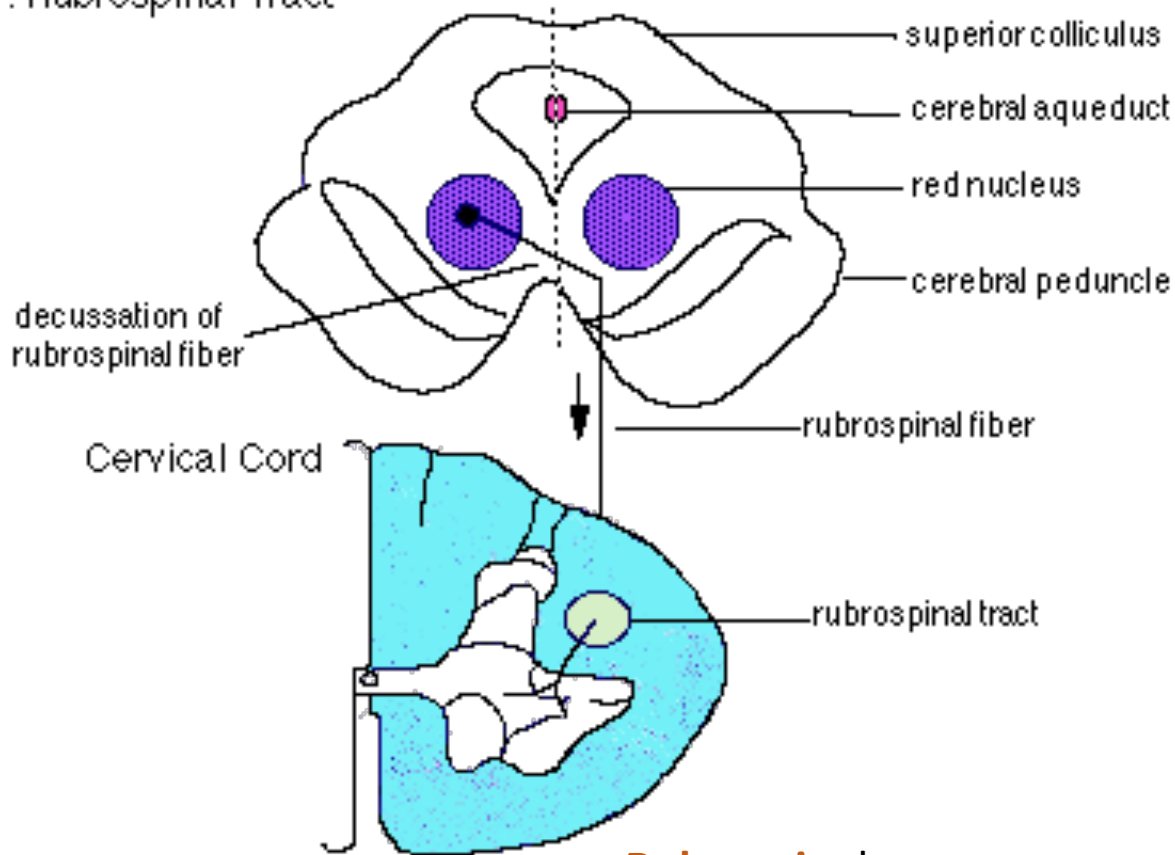
في عنا ال vestibular nucleus موجودة بالدماع مسؤولة عن الاتزان بال bones

➤ Medial reticulospinal

➤ Lateral reticulospinal

Reticular formation » network of neurons in the middle of brain stem and it's responsible of dull aching pain and arousing


## 1. Rubrospinal Tract



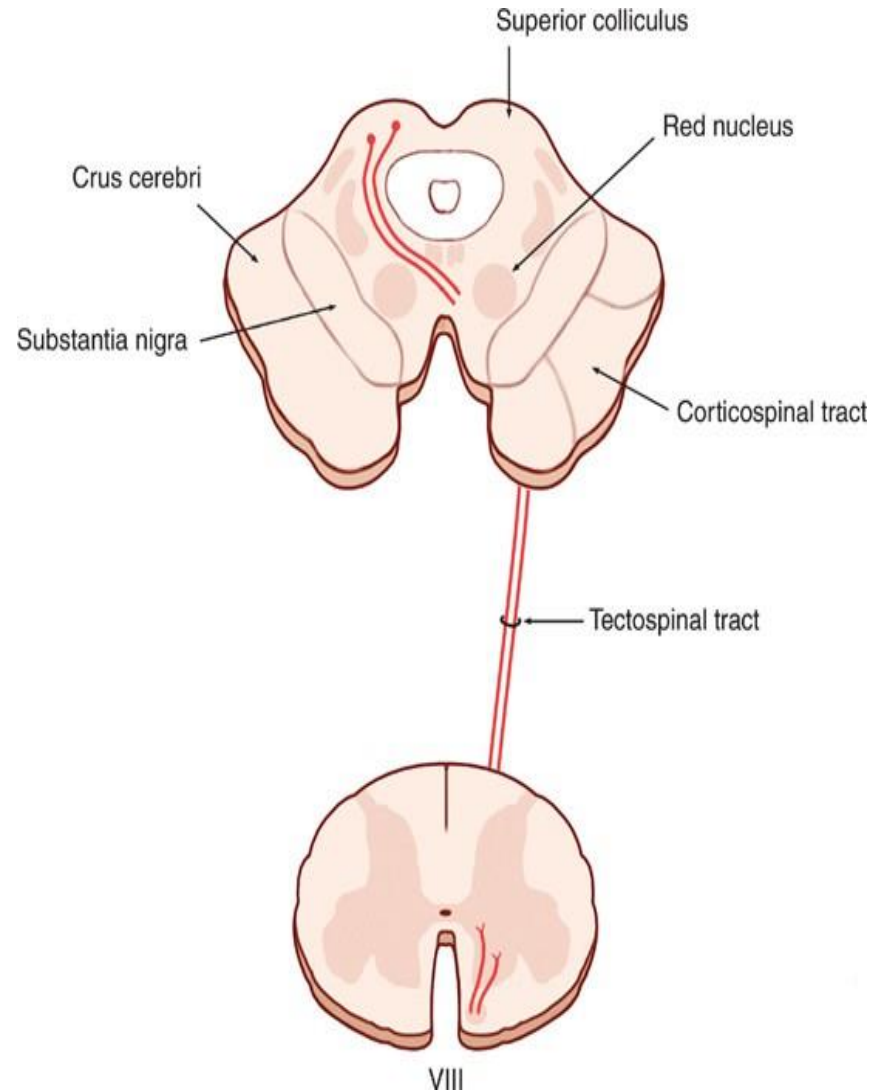
### Rubrospinal:

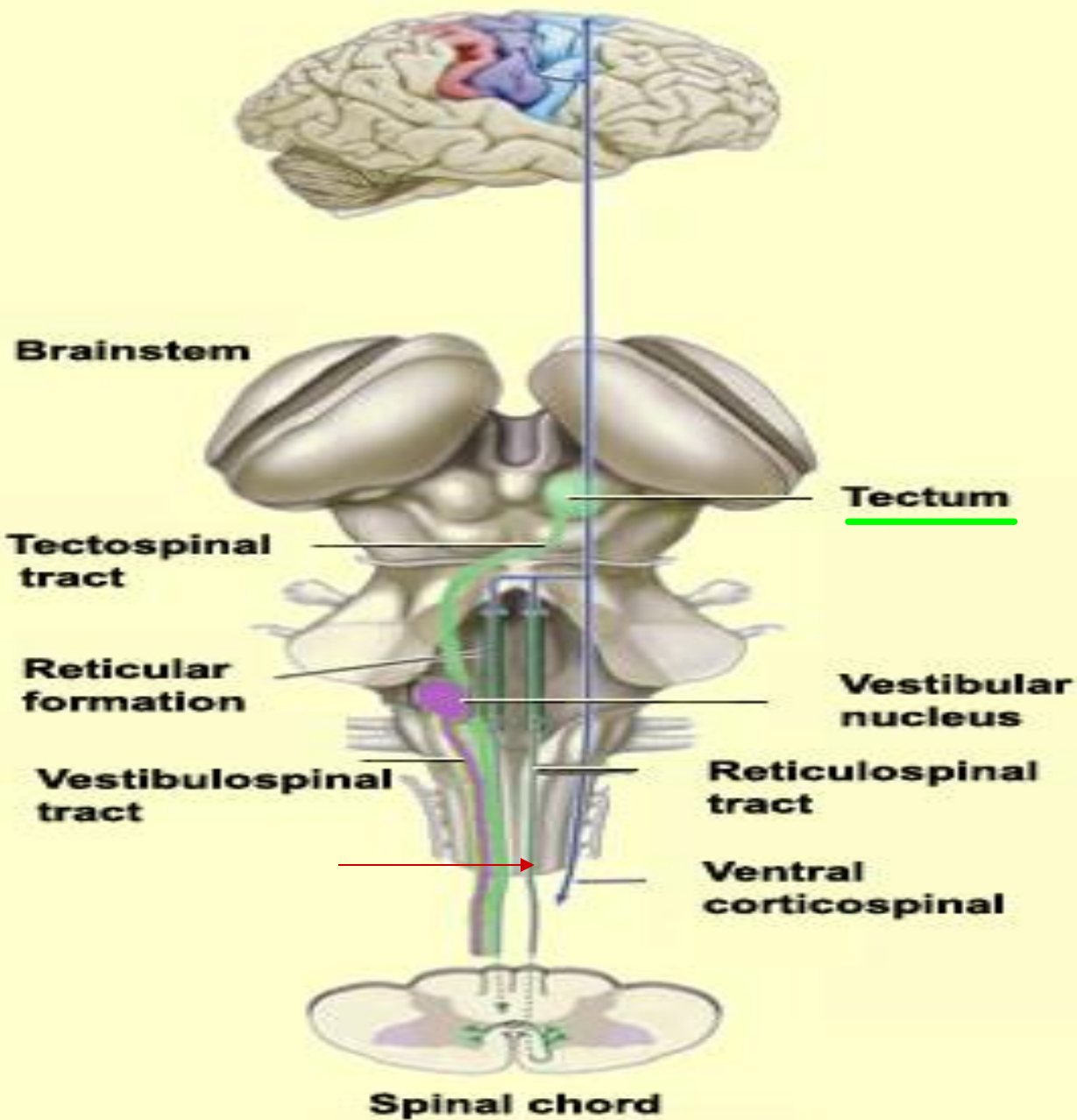
- Origin : red nucleus **Anterior**
- Decussate in ventral decussation in the mid brain
- Lies in lateral white column of cervical segment
- Lateral group of cervical anterior horn cells
- Facilitate flexors of upper limb

# Tecto spinal tracts

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

يعني حدا ضربيني او خبطني او اجا صوت عالي  
فجأة او السما صوت من رعد او اشني كل هاي  
الاشياء راح تخليك تلتفت ناحيتها و هاد الجزء  
المسؤول عن حركة ال head and neck بهيك حالات





# Reticulo-spinal tracts

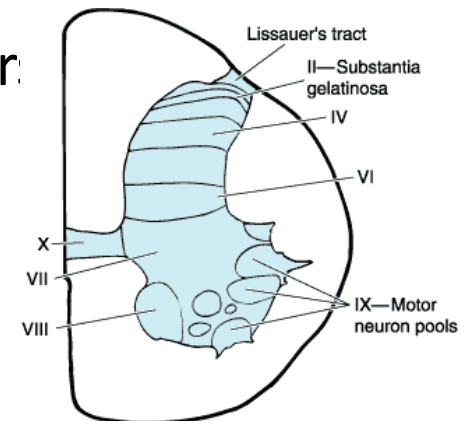
مش مطلوب اشي غير اساميهم

## Medial reticulo-spinal

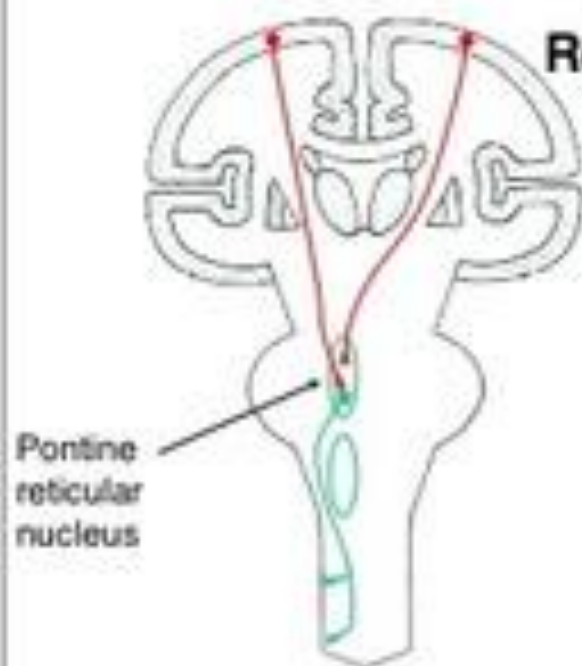
- Pontine reticular formation
- Uncrossed
- Anterior column
- Gamma motor neuron of lamina IX
- Facilitate extensors

## Lateral reticulo-spinal

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



## Pontine (Medial) Reticulospinal Tract



Motor Neuron Pool

Pontine reticulospinal tract

A cross-section of the spinal cord showing the Pontine reticulospinal tract as a dark line in the anterior horn, descending towards the Motor Neuron Pool. The tract is shown in a medial position, consistent with its name.

# Vestibulo-spinal tracts

مش مطلوب اشئي غير اساميهم

## Medial vestibulospinal

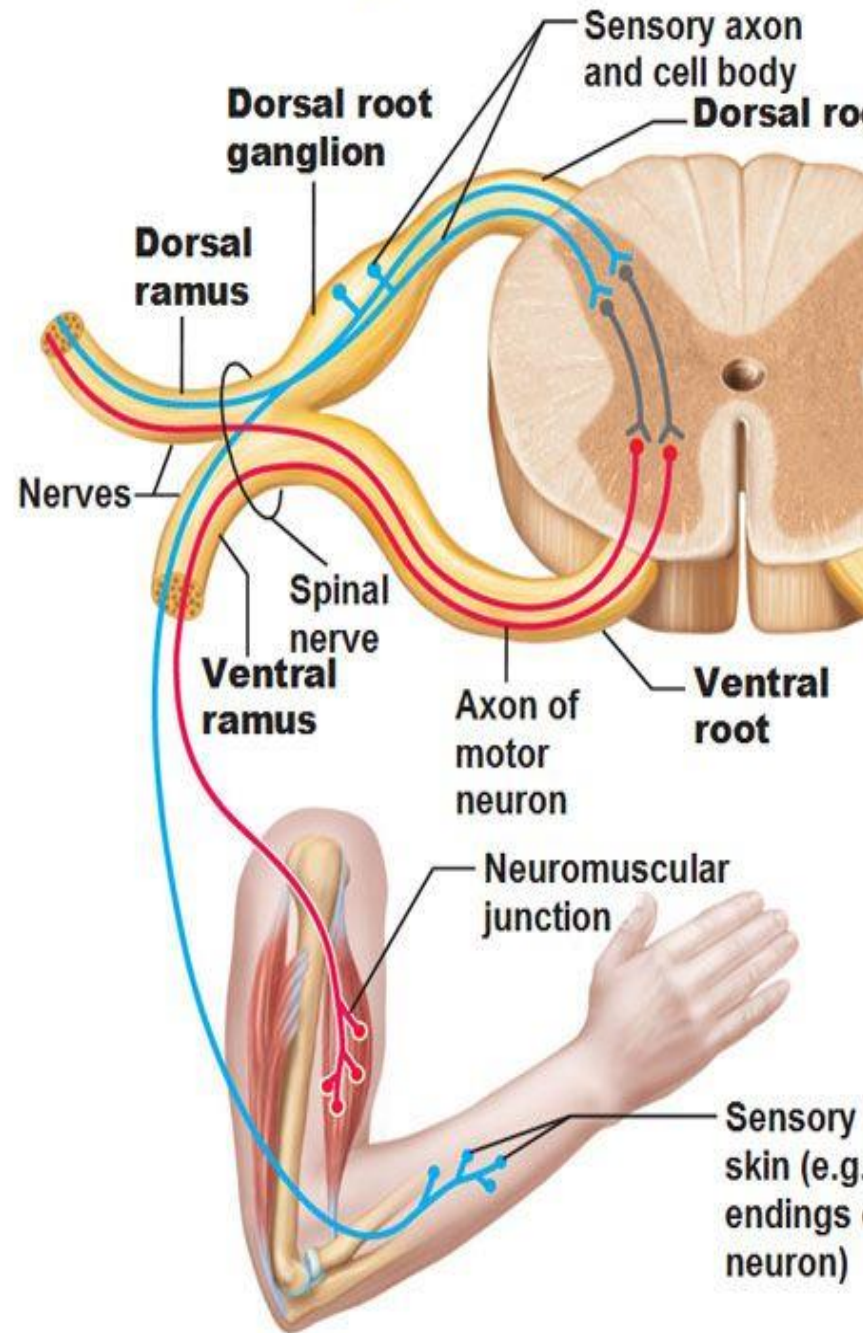
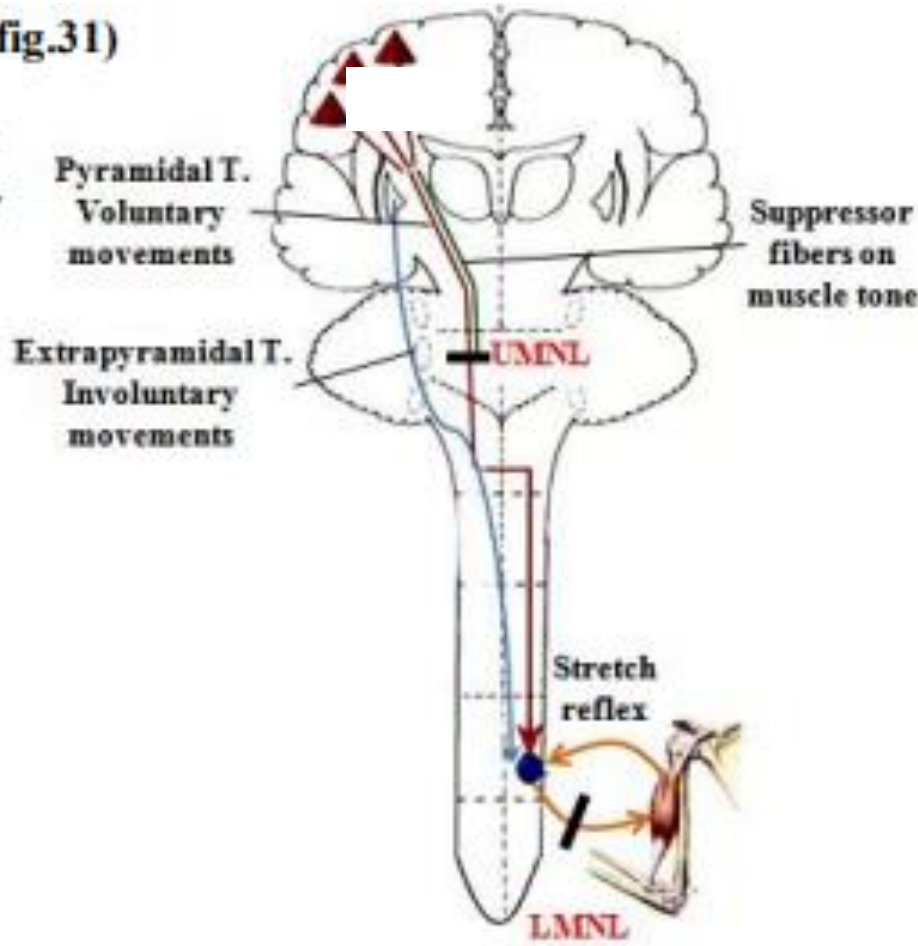
- Arise from medial vestibular
- Doesn't cross to the opposite side
- Anterior column to T3
- Alpha and gamma neurons of extensors
- Keep head and vision horizontal when body is tilted

## Lateral vestibule

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

# Spinal Nerves

fig.31)





بدنا نحكي شوي عن ال stretch reflex يعني مثلا لو عملنا stretch لوحدة من العضلات مثلا لل biceps او لل knee، لما تعمل ضغطة راح يصير stretching للعضل و راح تبعت بال sensation اشني اسمه reflex arch بروح عن طريق ال dorsal horn (التي باللون الازرق) بعدين ببعت لل anterior horn عشان يعمل contraction ..

هل هون في تدخل من ال pyramidal او ال extra-pyramidal ؟ لا ما في صار reflex على طول شو يعني ؟ يعني لو في مريض بغيوبة ال cortex عنده غايبة و جربت تعمله reflex راح يصير ولا لاً ؟ اكيد راح يصير reflex زي حالة ال reflex اذا حسينا بوجع او حدا انحرق لمس اشني سخن عشان يبعد ايده عن مصدر الالم، نفسه مريض الغيبوبة وانت تركبه canula or catheter راح تلاحظ انه ممكن يسحب ايده او يدفش ايده هاد كله reflex

البنادم العادي الصافي ال pyramidal tract بتعمله inhibition يعني انت و صاحي مش منطق كل اشني يلمسك تعمله reflex انت صاحي و عارف شو بصير حواليك كل ما قل مستوى ال consciousness او يزيد ال stress راح تتاثر ال pyramidal function و يزيد ال reflex .. مدام بتعمل inhibition معناها اذا خربت ال pyramidal راح يصير reflex ال exaggeration

مبارح حكينا انه ال sensory pathway عنا ٣ neurons اما في ال motor / pyramidal هم تتين بس واحد من ال cortex لحد ال anterior horn cells و الثاني من ال anterior horn cell للعضلة لو صار lesion بال neuron الاول لكن الضرر لا يشمل ال anterior horn cells (حكي هاي معلومة مهمة جدا عنده) وقتها راح يكون اسمه upper motor neuron lesion لكن لو ال lesion بال anterior horn cell او ال nerve الرايح للعضلة بنسميه lower motor neuron lesion

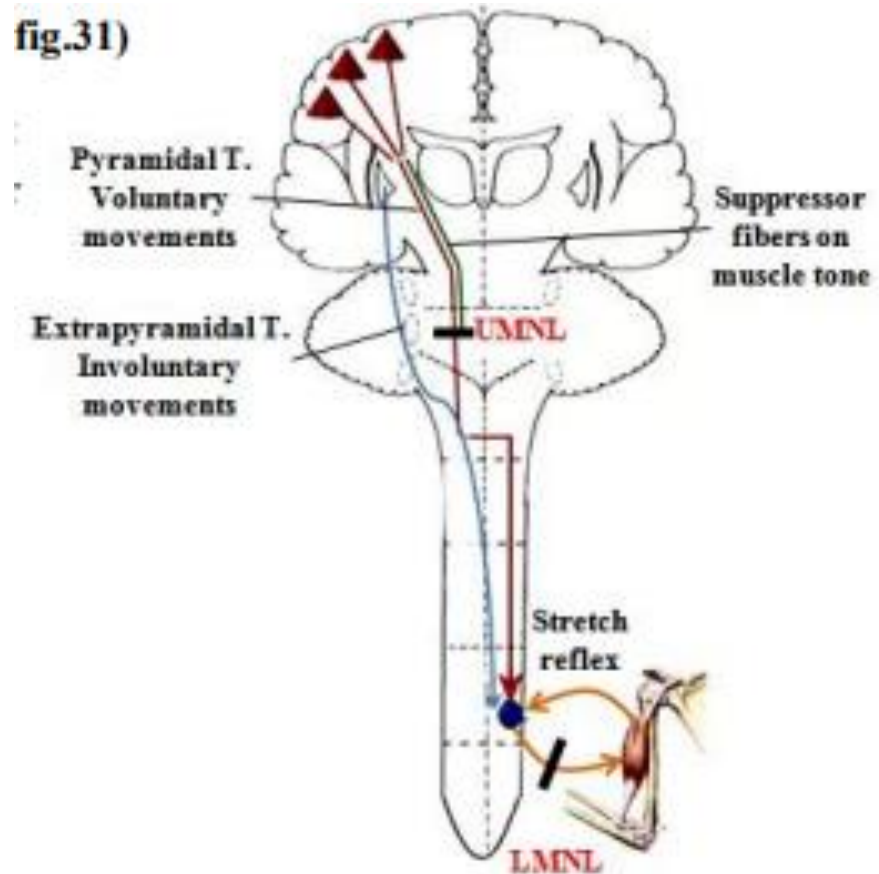
# Upper & Lower Motor Neuron Lesions

**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

هاد الحكي بالنسبة لل spinal cord اما  
بال brain stem عنا cranial nerve  
nuclei و بنعاملها نفس معاملة ال  
anterior horn cell يعني لو ال  
upper neuron الي قبلها يكون  
lower او ب الي تحت يكون

fig.31)



مهم

	Upper Motor Neuron Lesion [UMNL]	Lower Motor Neuron Lesion [LMNL]
Means	Lesion of the pyramidal tract e.g. capsular hemiplegia. او نزيف او	Lesion of AHCs or motor cranial nuclei e.g. poliomyelitis. مثل الأطفال
Movements	Only voluntary information 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

يعني مثلا لو حكيت للمريض اضحك ما راح يقدر اما لو صار موقف قدامه بضحك بقدر يضحك لا ارادي

Continuous contraction of the muscle without any voluntary action

اكثر مكان ممكن تصير في مشكلة و تبين على المريض ال capsule انتبهوا كيف كل ال fibers الي بجسمنا محشورة بالمكان الصغير هاد ف اذا صار بجزء صغير منها جلطة او نزيف راح تبين على طول و يصير اشبي اسمه hemiplegia يعني شلل نصفي تذكروا لو جهة اليمين خربت الشلل يكون بجهة الشمال بالجسم

يعني لما تيجي تفتح ايد المريض بتشد بتشد بالعافية بتفتحها بتكون ايده خشبة



# 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.

es.

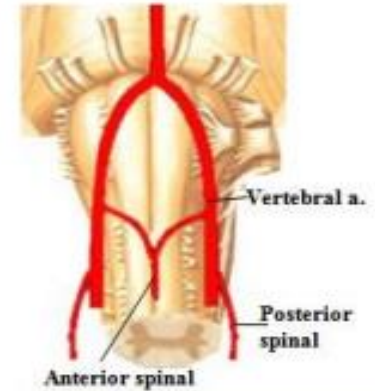


Figure 35: spinal arteries

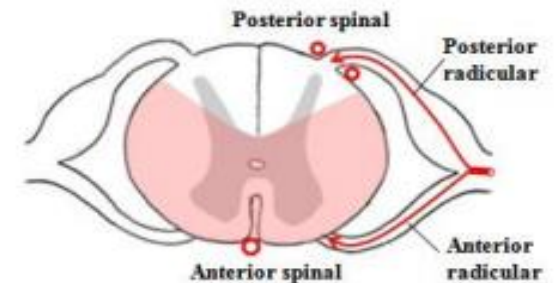


Figure 36: blood supply of spinal cord

## 2. Posterior Spinal Arteries

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

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

es.

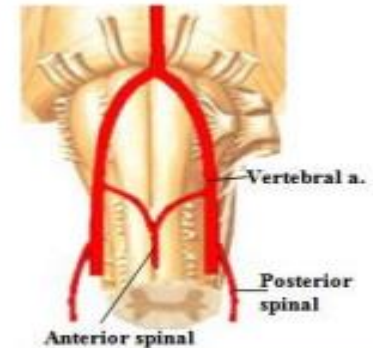


Figure 35: spinal arteries

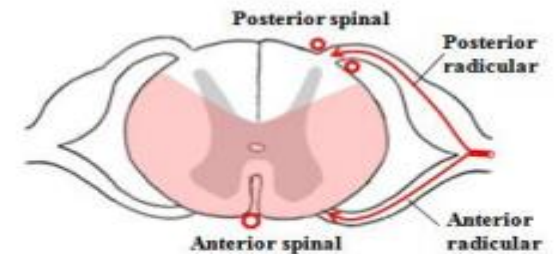


Figure 36: blood supply of spinal cord

### 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.

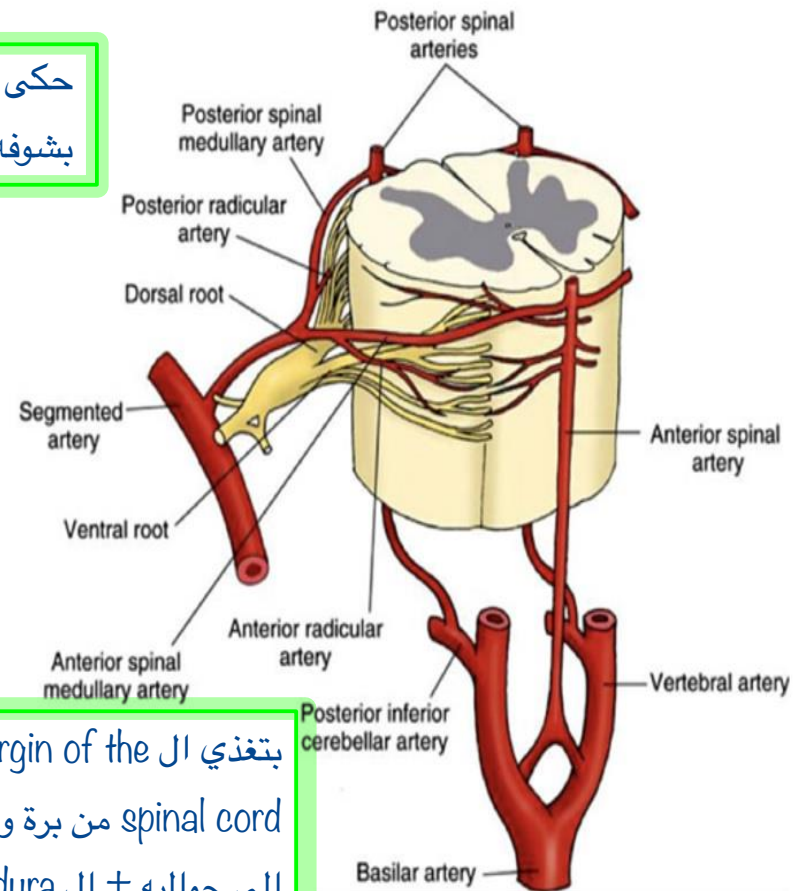
They give anterior & posterior radicular branches that pass along the ventral & dorsal roots to reach the surface of the spinal cord & form an arterial circle of anastomosis with the branches of anterior & posterior spinal arteries

“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.

حكى كل اtery

بشوفه بيشحد منه



بتغذي ال margin of the

spinal cord من برة و الاشياء

الي حوالية + ال dura

**Note:**

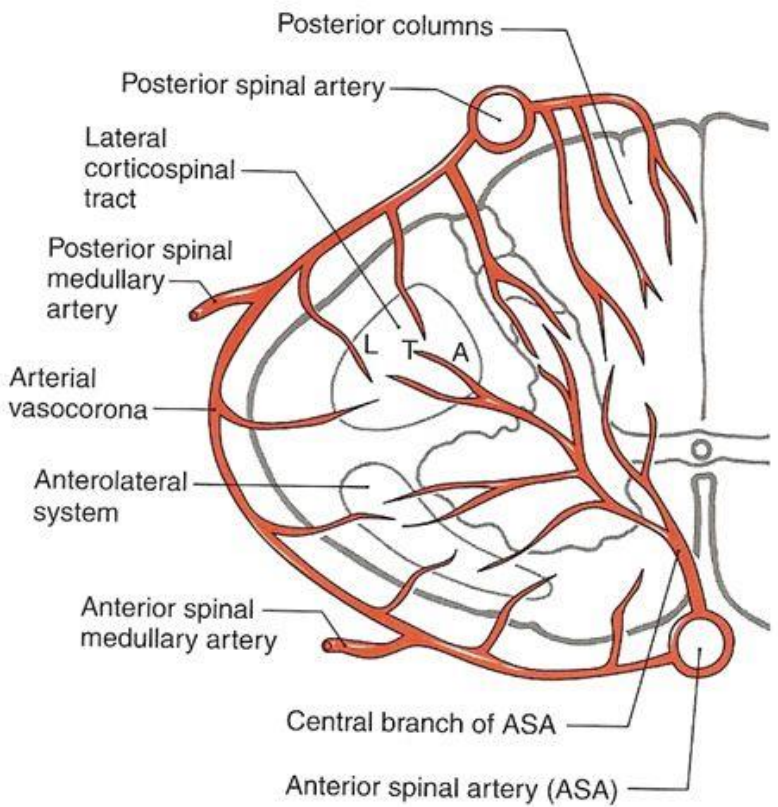
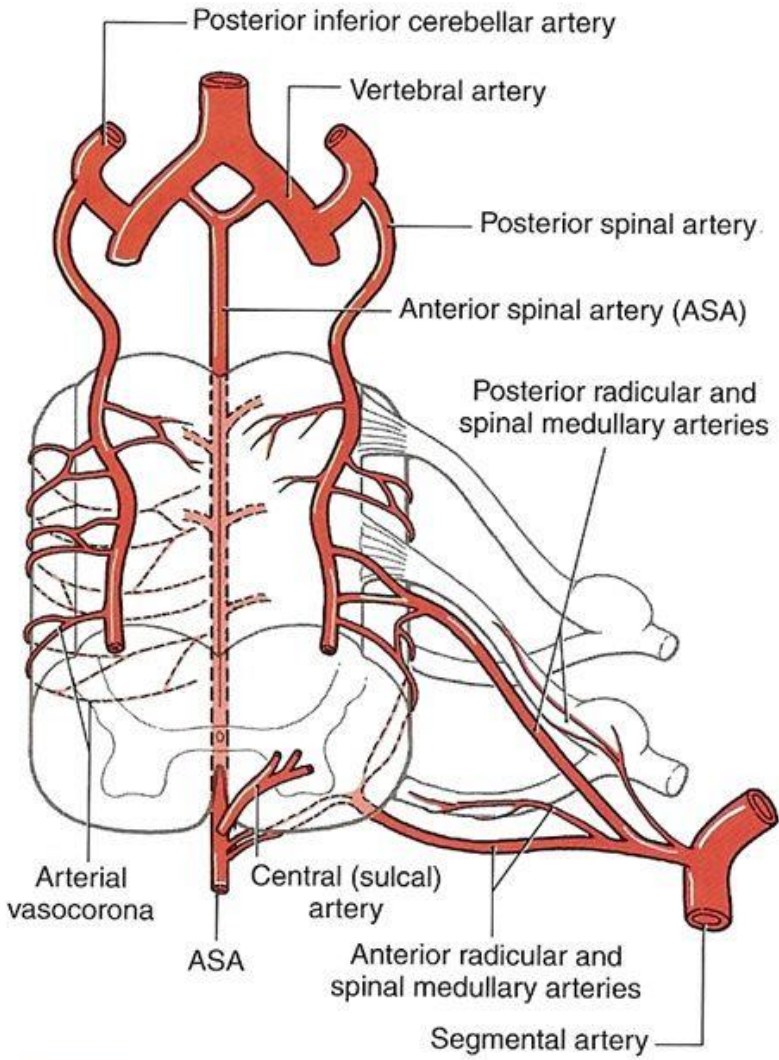
Once an artery enters the substance of the spinal cord, it is an end artery.

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.

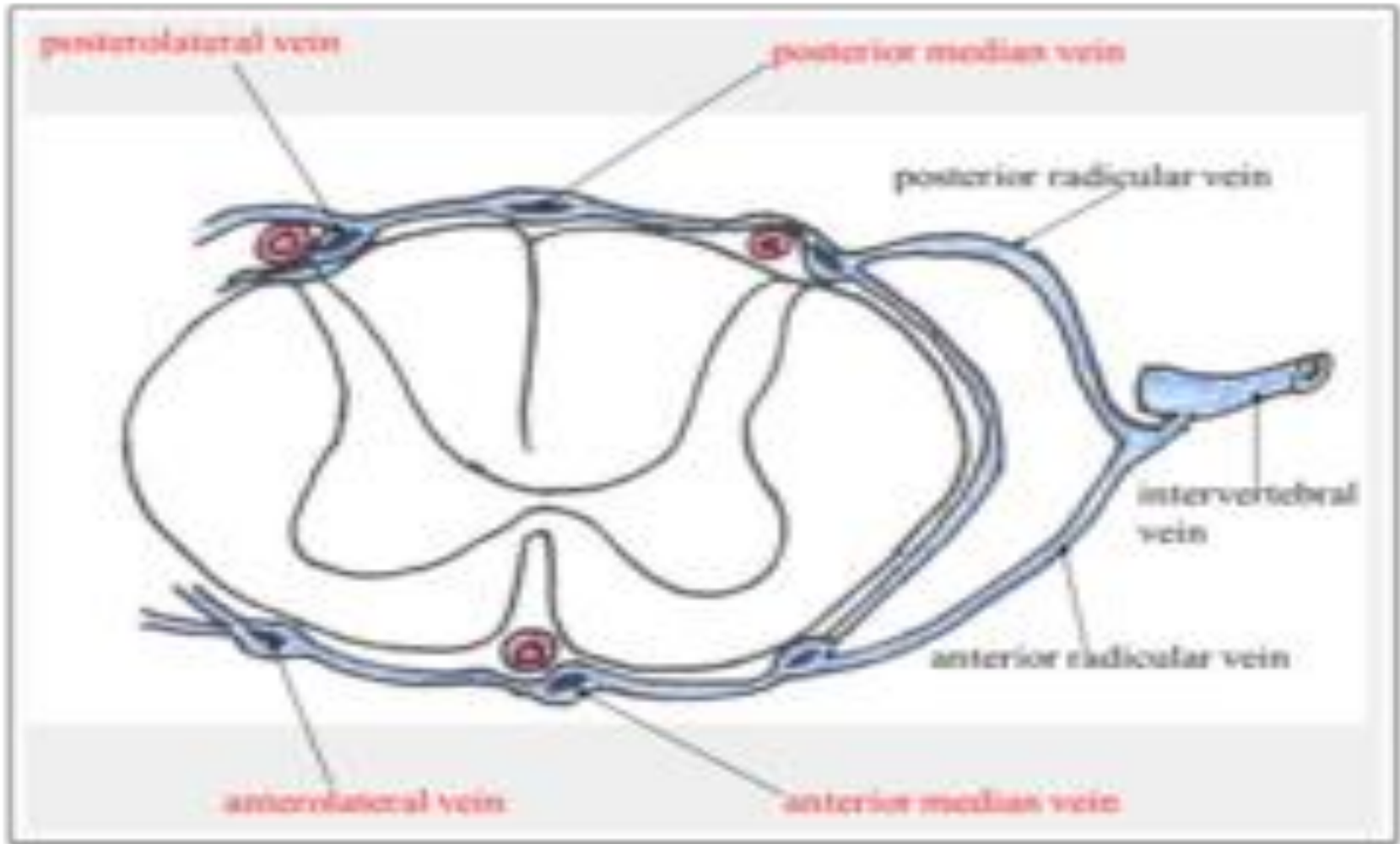
The richest blood supply is to the lumbar region.

# BLOOD SUPPLY OF SPINAL CORD





عنا ة veins بتجمعوا و بصبوا بال intervertebral vein هاد كل الي نعرفه



في ٧ سلايدات اجلهم للمحاضرة الجاي بعنوان spinal cord lesions

**Than you**

