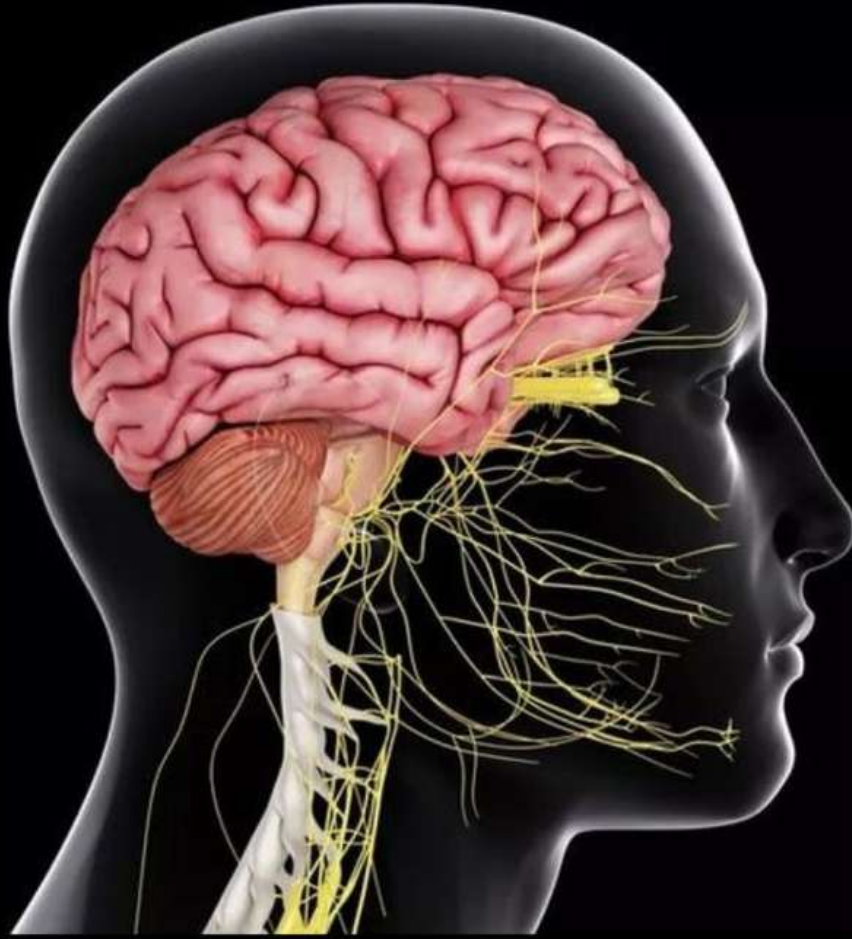




CENTRAL NERVOUS SYSTEM



SUBJECT : Anatomy

LEC NO. : Lab 1

DONE BY : Batool ALzubaidi

وَقُلْ رَبِّ زِدْنِي عِلْمًا

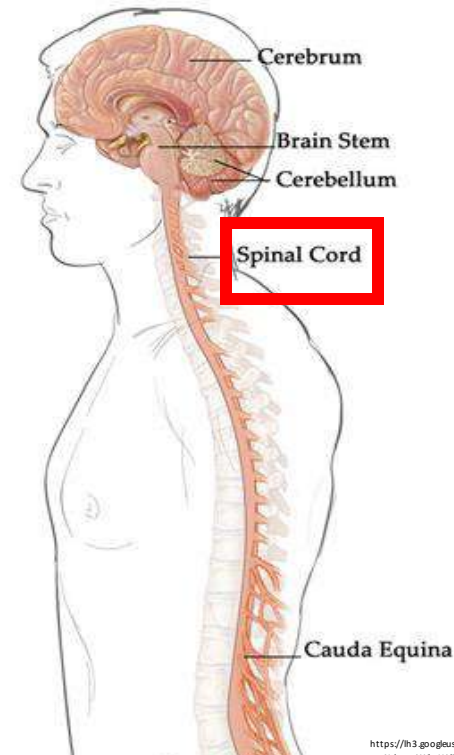
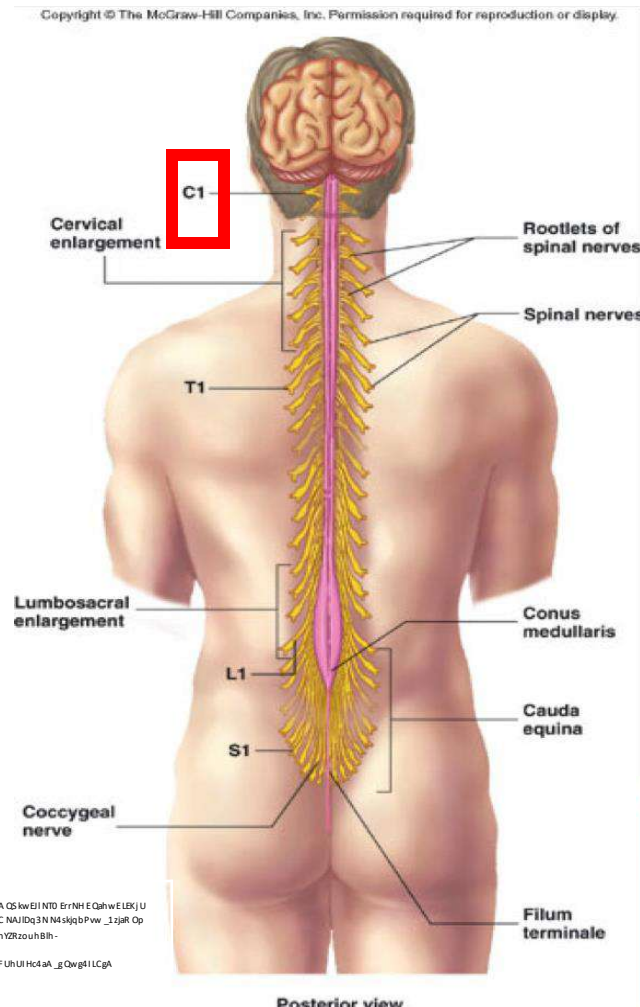
Spinal Cord

Practical section 1

ملاحظة الاشياء النظرية الي طلبها باللاب حطيتها كلها تقريبا كل اشئ مذكور باللاب كتبت عنده او حطيت السلايد تاعه في اشياء مليات بالمحاضرات منها ما انذكر باللاب ابدأ فما حطيتها الي محطوط ان شاء الله شامل و اكيد احسن اشئ انكم تدرسوه بعد مراجعة الاناتومي

The Spinal Cord

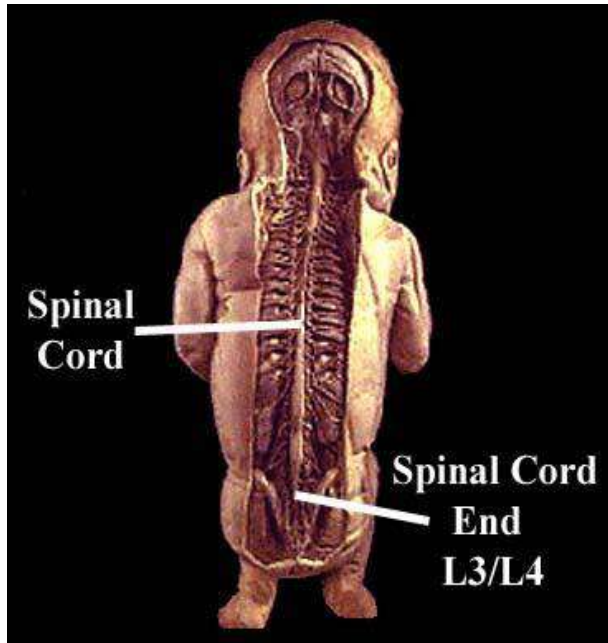
It starts at the **upper border of 1st cervical vertebra** as a **continuation of the medulla oblongata**.



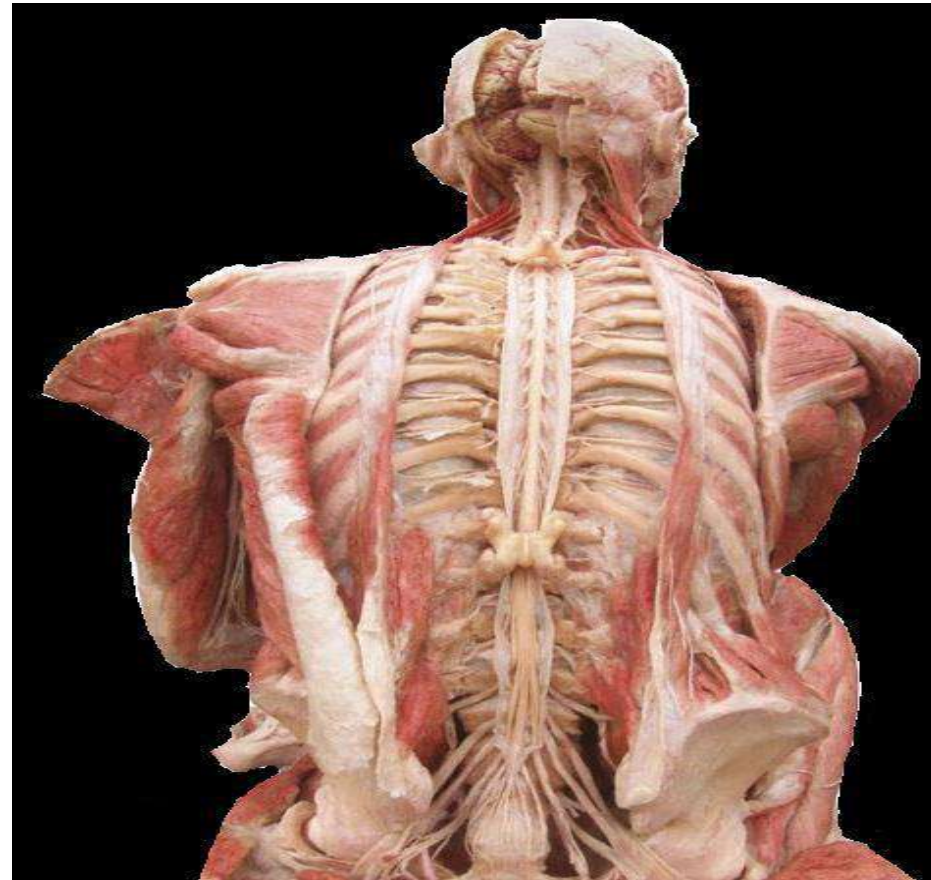
لما الجنين يكون ببطن امه يكون ماخذ طول ال vertebral column كامل، و لكن ال growth of bone اسرع من ال growth of central nervous system بالتالي ال canal بتكبر و هو بصيرله growth بس يكون limited و لما ينولد يكون عند L3 و بس يكبر بوصل level of L1

https://www.google.com/eg/search?hl=en-EG&q=foramen+magnu+spinal+cord&btn=ch&bs=sim_gCA_QS_kwEINtD_ErNH_EqhwLEKjU_2ACqAAwLELCMpwgtpgCAM_SKIQIhQJCCdsc4hUA9EjzwmHC_NAUIdq3N_N4skjbpPw_1zjR_Op_M64DMAMlM1_1_Vj5m3yRqPvriIC2FhS3D8jg7JuxKuPbWuETHYRzoUhBh-ZghBPdXOX9hIAEDA+Qq7-CBoKCGgARIBxw2jwW&as=X&wd=0ahUK_twZDdPRpu_Jah_UF_UhUI_Hc4A_g_Qwgt1LCpA

- The spinal cord ends at the disc between 1st and 2nd lumbar vertebrae (in adults).
- While it ends opposite 3rd lumbar vertebra (at birth).



https://www.google.com/eg/search?hl=en-EG&q=vertebrae+and+lumb+ar+enlar+gement+of+the+spinal+cord+&btnI=sch&btnS=isi+mg+CAQSkw+EIjN0e+IABESaahw+BLEKj+U2AQIAAw+LELC.MpwgpgpCA+MSKJ0ZhmU+GZMhBmqGak+O8haGfA+WDqCLZM6IC7et.M420CSrJNs5g0+AMC4H0XzrPz+15_15ZJK11brNTW-rjgwsgu8uQp1z7DrfY0SKdH5FHvMfHC6GfGfA+EDAs+Qq7-CBoKCgARIEK7rgw&sa=X&ved=0ahUK+EWjCKXp-1AhUwRBUIHTM2BbKw_g4ILCgA

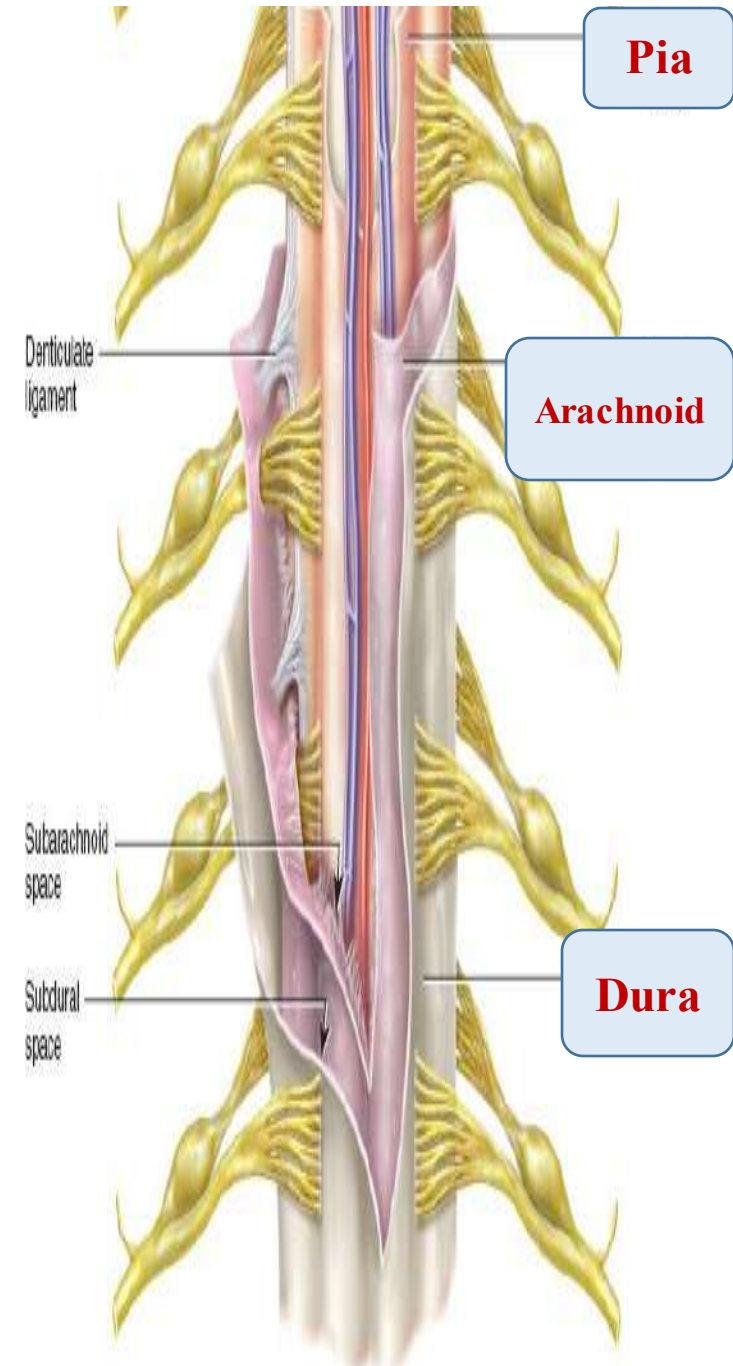


<https://h3.googleusercontent.com/nx-Nick5dP7PreqD06hgHz2INKS0Emni5A0fNbLm8JqMUR2ka0t5v4A27yp1=s85>

طالع من الجناح ٢١ pairs of denticulum
arachnoid and dura ال pia بال ligaments

The spinal cord is covered by
3 meninges:

- 1- Dura matter** (the outer layer).
- 2- Arachnoid** (middle layer).
- 3- Pia** (inner layer).



ال dura و ال arachnoid ما بنتهوا عند ال L1 زي ال spinal cord بضلوا
مكملين لعند level of S2 (الجزء منهم من عند ال L1 ال S2 ما فيه ال spinal
cord) .. اما ال pia بتنتهي عند ال lower border of the spinal cord
بس بتكمل زي الخيط ماشي جوا ال sac of arachnoid and dura
لحد level S2 بعدين بعمل penetratiion بثقبها و بكمل لآخر
coccygeal piece و بسمي هاد الجزء al filum terminal و الي بعمله
انه بشد ال spinal cord لتحت عشان ما يتحرك يمين و شمال

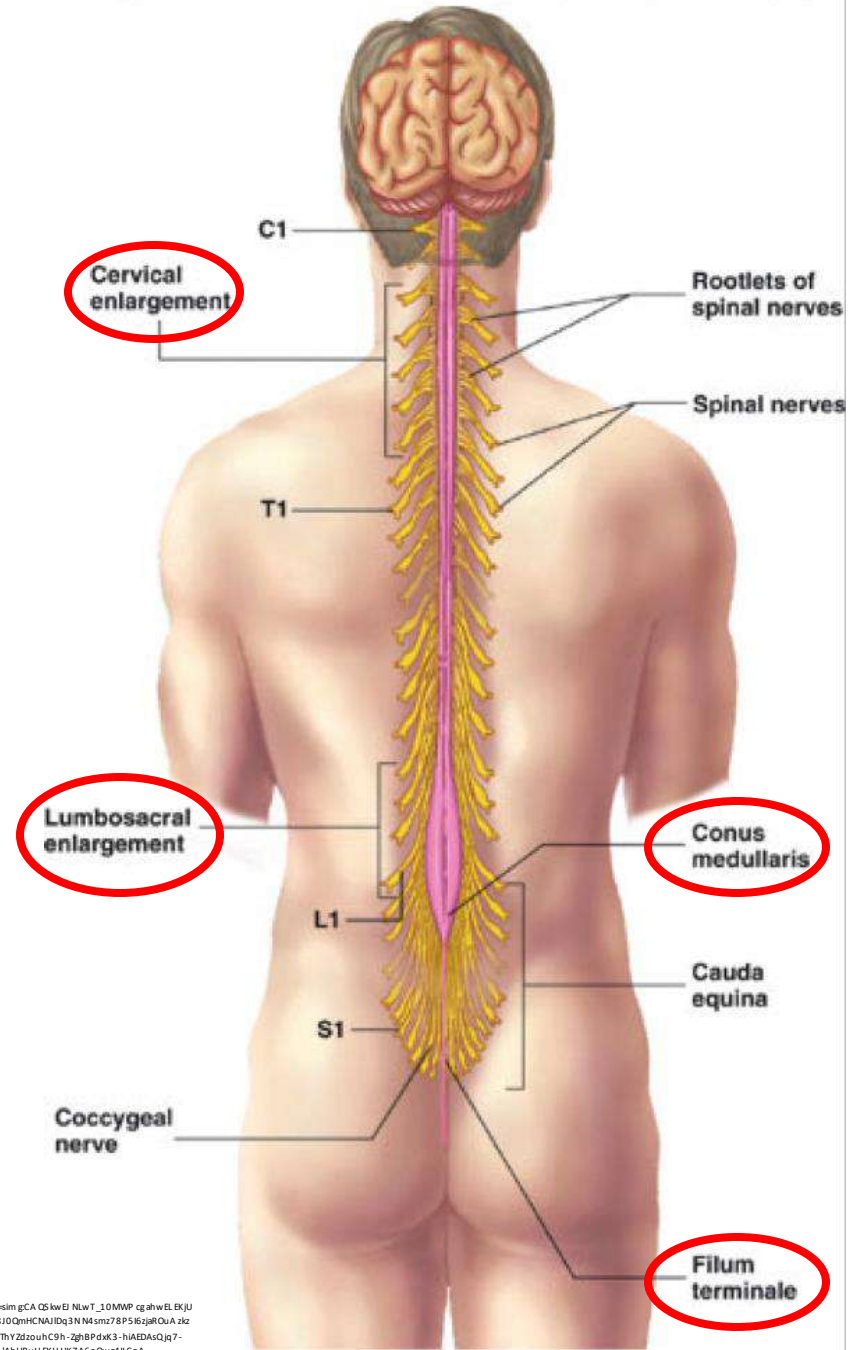
Cervical » gives brachial plexus which supplies muscles and sensations of upper limbs, lumbar » supplies muscles and sensations of lower limbs

- It is **cylindrical** in shape with **2 enlargements : Cervical, and Lumbar.**

Brachial plexus

Lumbar and sacral plexus

- Its end is called **“Conus medullaris”** from which a pial ligament called **“Filum terminale”** extends to be attached to the back of coccyx.

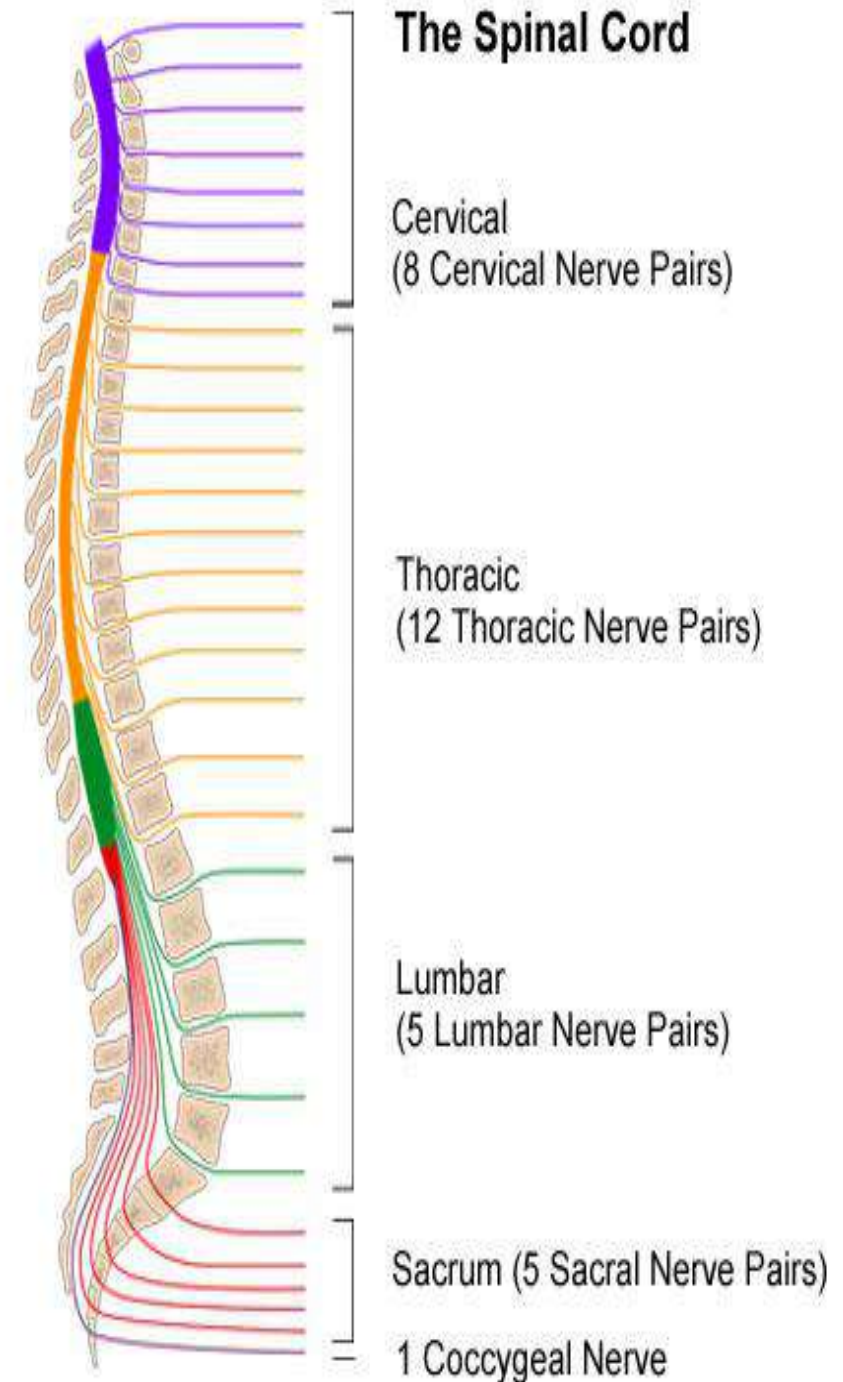


https://www.google.com/search?hl=en-ES&q=foramen+venosum+spinal+cord&btn=ch&bs=sim&ca=0&kw=El+NWt+_10MMP+cgahwEL+KjJ+2AQaAwLELC+MpwgPggC+AM+Sk+QJ+QCCd+C4h+IA8810QhHCNAJIDQ3N+N4smz78P5+K6jRQ+A+2lc+oAIOfI_1+VP5+m3QRpZLIC2FN53D8J6RgDyPBWUeThYzdsouhC9h-Zgh8PdK3-HAEDASQJ7-CBoKcggARIBwW2jwW&as&ved=0ahUKtwj_54Ivp-_JAHURuH8KHUK7A6oQw8tLCgA

The Spinal Cord

The cord is divided into segments **(31 segments)** giving rise to 31 pairs of spinal nerves:

- A- **Cervical segments : 8**
- B- **Thoracic segments: 12.**
- C- **Lumbar segments: 5.**
- D- **Sacral segments: 5.**
- E- **Single coccygeal segment.**



Spinal cord segments & levels

ال nerves بتكون oblique نازلة لتحت

Spinal cord segments don't lie opposite the corresponding vertebra as the spinal cord is shorter than the vertebral column

تذكروا ال cervical segments عددهم 8 اما ال vertebrae بس 7

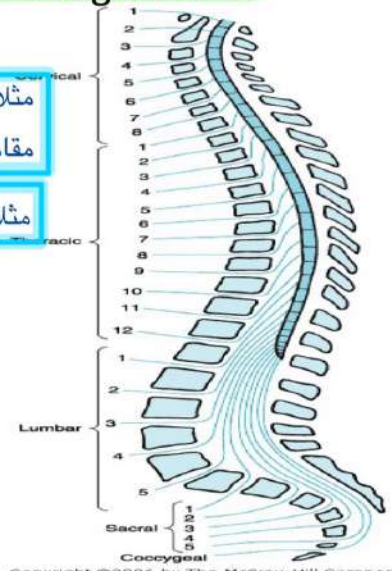
مهم بيضي جالاهفقات واثنا

- **Cervical region:** subtract one from spinal cord segment to get number of vertebra
- **In upper 6 thoracic:** subtract 2
- **In lower 6 thoracic:** subtract 3
- **In lumbar:** subtract 4
- **All sacral & coccygeal:** lie opposite L1 & L2

مثلا T9 segment

مقابل T6 vertebrae

مثلا L5 segment مقابل L1 vertebrae



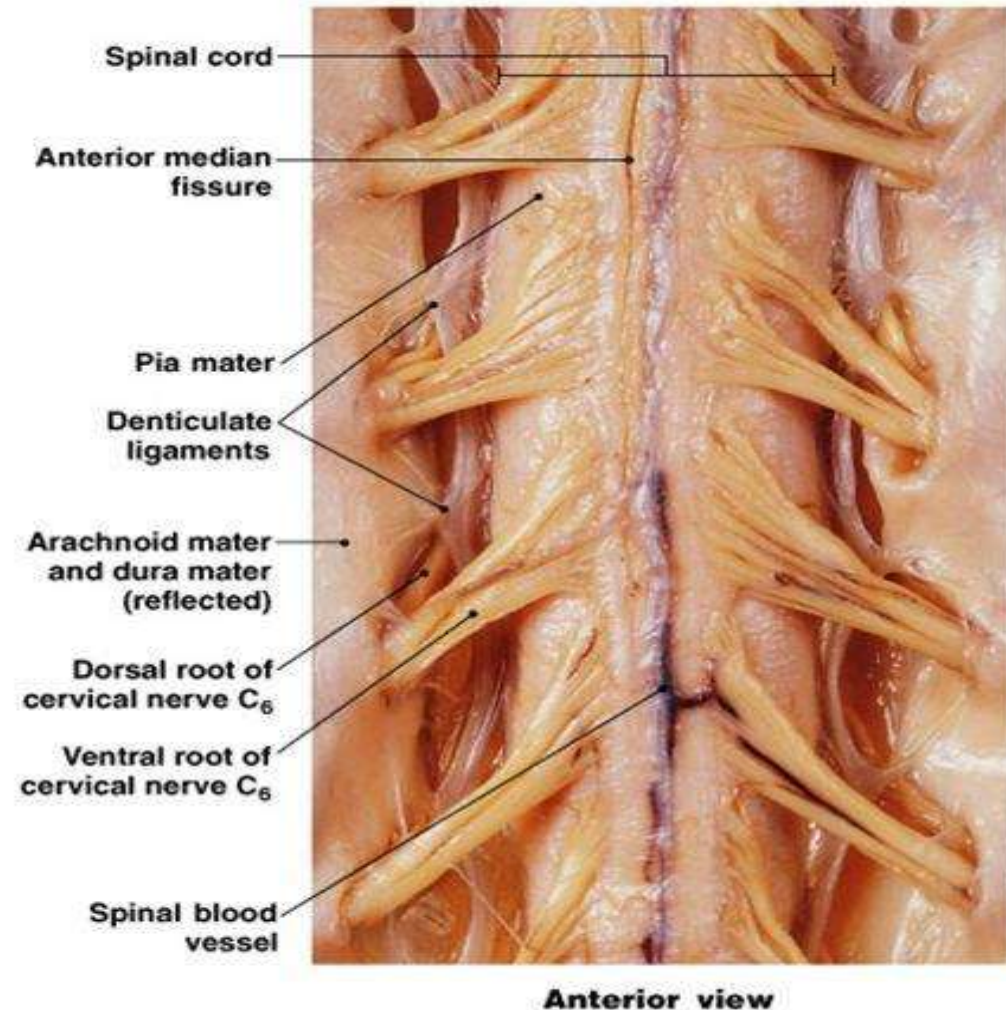
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مثلا لو اجا مريض عنده compression ب T1 segment اي vertebrae راح تكون ضاغطة عليه؟ هل T1 vertebrae؟ لا راح يكون فوق لو عنده ديسك ب 7 cervical و ضاغط على nerve بال spinal cord هل راح يكون ضاغط على رقم 7 segment؟ برضه لا

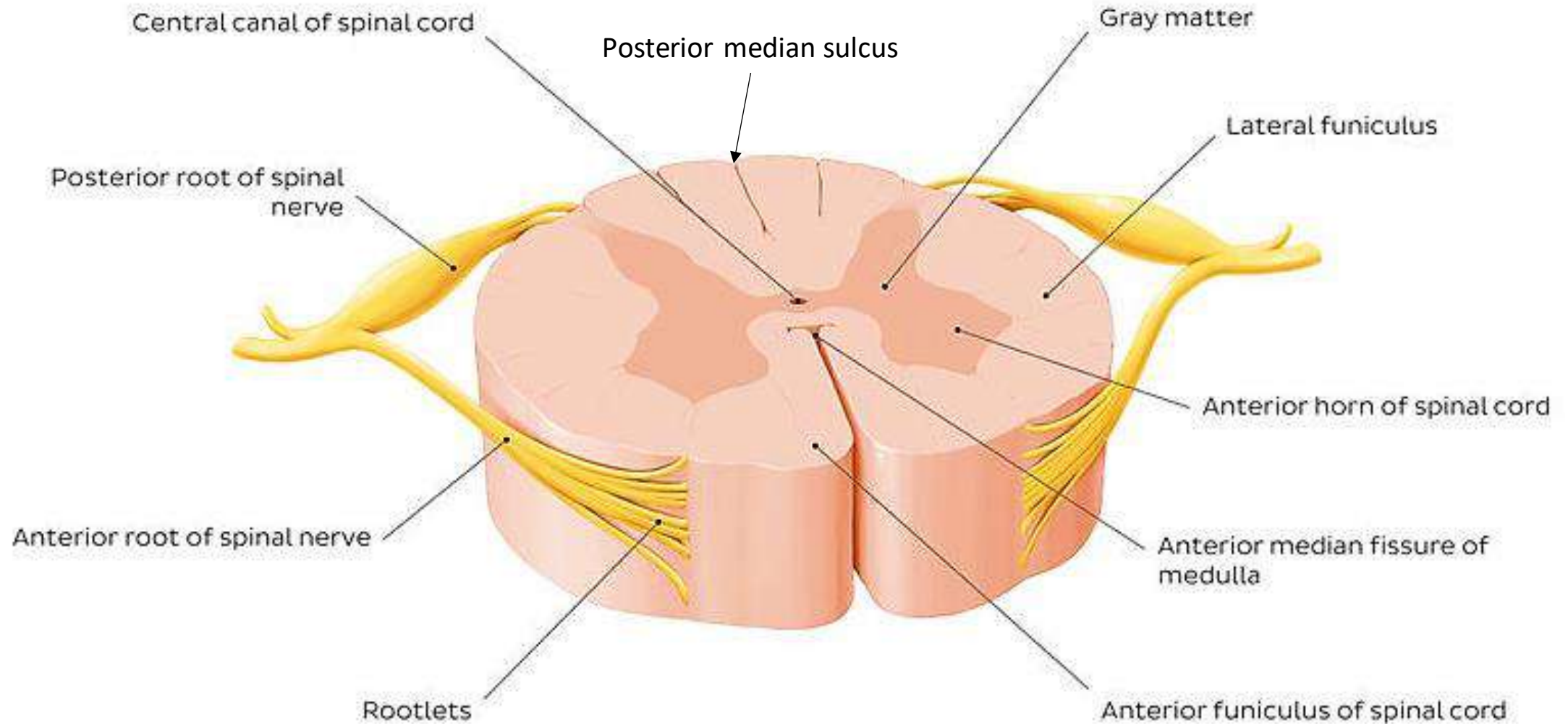
شو هي ال cauda equina؟ مش حكيينا الجنين ببطن امه ال spinal cord بكون على طول ال vertebrae كلهم و بكون كل nerve طالع من ال corresponding vertebrae و بعدها بقصر ال spinal cord بس ال nerves لسنا بتطلع من ال vertebral foramina تا عندها يعني S2 nerve راح يطلع من S2 vertebrae و لكن ال origin راح يكون من ال segment الي عند ال lumbar region.. ف ال collection تا عندها نهاية ال lumbar, sacral, coccygeal nerves راح يتجمعوا ك nerves منفصلة بالكيس تا عندها ال dura and arachnoid و اسميهم cauda equina زي ذيل الحصان

- Paired **denticulate ligaments**:
 - extend from pia mater to dura mater
 - stabilize side-to-side movement

b. Ligamentum denticulatum: one on each side of the cord, extending laterally between the anterior and posterior roots of spinal nerves. it has 21 teeth connecting the pia (on one side) to the arachnoid and dura (on the other side).



Cross Section of the Spinal Cord



ال cross section of the spinal cord عننا ventral and dorsal horns
 ذكر ال nuclei تاعت ال ventral بس راح احط تعون ال dorsal احتياط

- **The nuclei in the ventral horn are arranged in three groups:**

- 1. **Medial Group:** present throughout the whole length of the spinal cord and supply trunk muscles
 Supplies diaphragm
- 2. **Central Group:** present only in some cervical segments e.g. Phrenic Nucleus C3,4,5 & spinal accessory nucleus (C1-5).
 Supplies trapezius muscle
- 3. **Lateral Group:** present in cervical & lumbosacral segments and supply limb muscles

Nuclei of Grey matter of Spinal Cord

H shaped structure » gray matter
 Anterior is broad » ventral horn
 Posterior » dorsal horn

Nucleus » collection of neurons in the central nervous system (spinal cord or the brain)

In Dorsal Horn: - Nuclei are mainly sensory

1. **Substantia Gelatinosa of Rolandi:** Present at tip of dorsal horn in all segments of spinal cord.

Function: pain modulation. Responsible of brain sensation

2. **Nucleus Proprius:** Present anterior to Substantia Gelatinosa in all segments of spinal cord.

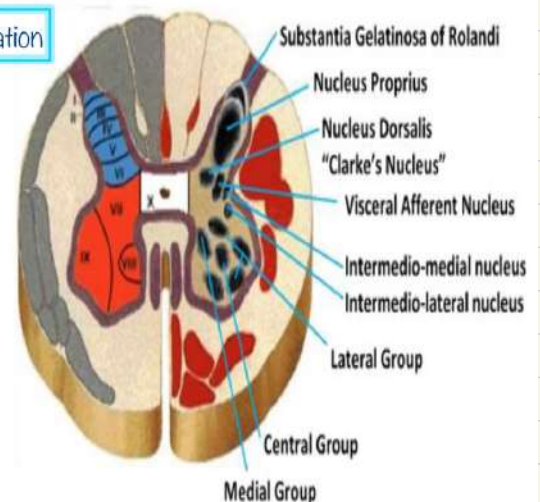
Function: relays exteroception.

Main sensory nucleus, receives most of sensations from external surface

3. **Nucleus Dorsalis "Clarke"s Nucleus":** Present at the base of dorsal horn in C8 to L3 segments of the spinal cord. Function: relays unconscious proprioception.

4. **Visceral Afferent Nucleus:** Present in C8 to L3 segments of the spinal cord lies lateral to Clarke"s Nucleus.

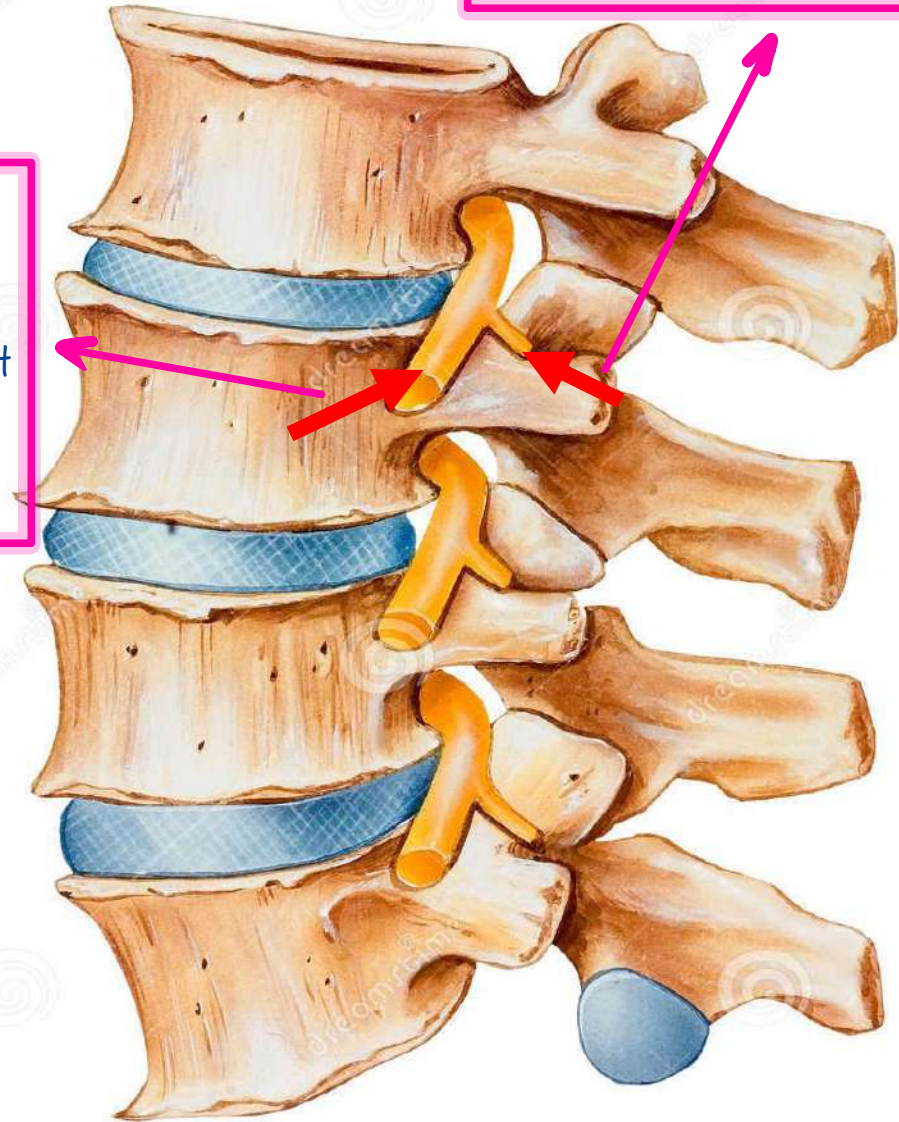
Function: relays visceral sensations.



Once the spinal nerve emerges from the intervertebral foramen, it divides into a large “Anterior ramus” and a small “Posterior ramus”

Anterior ramus → supplies most of body muscles

Posterior ramus » supplies the skin and muscles of the back



ال laminations تارة ال gracile and cuneate كيف كان ؟ ال sacral يكونوا medial و ال cervical يكونوا lateral

ال laminations مهمة جدا

اما ال laminations تارة ال antero-lateral
spino thalamic tract فهو العكس

Ascending and Descending Tracts

ال gracile and cuneate جاينين من ورا

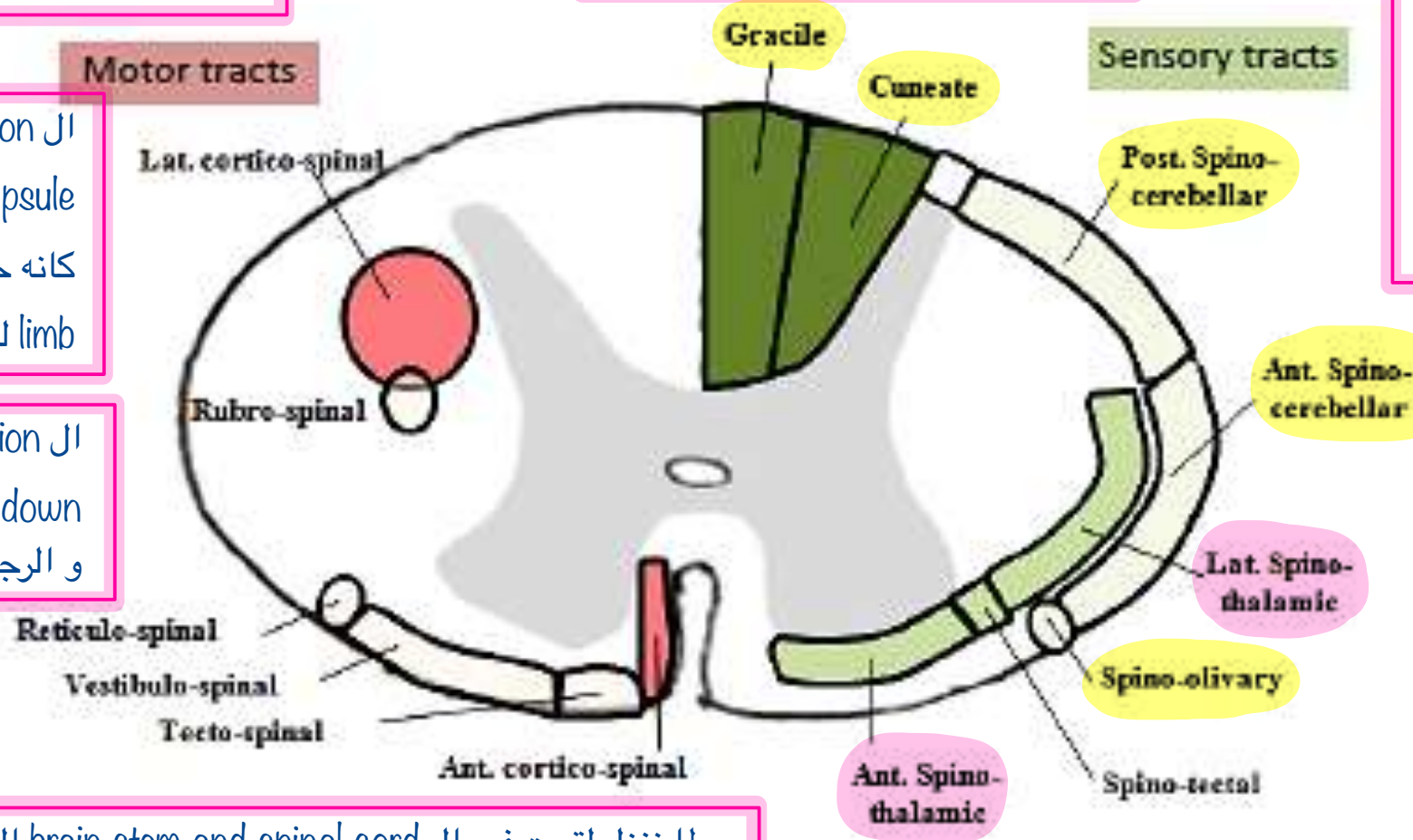
ال laminations تارة ال internal
corticospinal و ال capsule يكون
upper limb على وجهه ال و ال lower limb لورا

ال laminations بال cortex بتكون
upside down الراس يكون تحت
و الرجل بتكون فوق

و لما ننزل لتحت في ال brain stem and spinal cord ال laminations يكون انه ال
antero-lateral spinothalamic tract و ال cervical lateral و ال sacral زي

على ال superficial بال lateral
column في تعون ال
cerebellum الي هم ال
posterior and anterior
cerebellum, spino olivary

بال lateral and anterior
مسؤول ال antrolateral
system الي هو lateral
and anterior
spinothalamic



حطيتكم كل ال tracts تراجعوهم و ركزوا على ال action,lesion, epsi contra lateral, upper or loer motor neuron lesion

Unconscious proprioception » cerebellum

3 groups according to anatomy and physiology

ال lemniscus هو ال tract الي بمشي فيه ال brain stem

Tracts OF WHITE MATTER:

I. Ascending tracts (sensory): includes 3 main groups:

Sensation of position and movement

A. Lemniscal system: lie in the dorsal column - carries conscious proprioception (from deep structures such as muscles & joints) to the cerebral cortex: → ال consciousness يعني الاحساس وصلها

1. Gracile tract [lower body proprioception]
2. Cuneate tract [upper body proprioception]

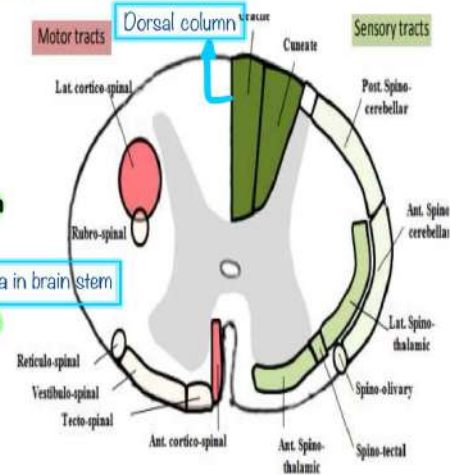
B. Unconscious proprioceptive tracts (to cerebellum): lie superficially in the lat. column

1. Two spino-cerebellar tracts (Post. & Ant.)
2. Spino-olivary tract Olivary nucleus » in medulla oblongata in brain stem

C. Anterolateral system: lie in the ant. and lat. columns - carries exteroception

1. Lat. Spinothalamic tract [pain & temp]
2. Ant. spinothalamic tract [crude touch]
3. Spino-reticular tract
4. Spino-tectal tract

2- Deep touch » fine touch (يعني لو لمست حدا بالقلم و هو مغمض) tactile discrimination (عيونه راح يقدر يحدد المكان ولا لا) vibration (تقطين راح تعرف نقطتين ولا نقطة وحدة)



https://youtu.be/_G-d8gKII0w?si=yU87qZDtyPRxaGtU

فيديو لطيف مجمع معلومات

II. Descending tracts (motor):

A. Pyramidal:

lateral & anterior corticospinal tracts.

From cortex » responsible for voluntary movements, skills

B. Extrapyramidal: - Brain stem & subcortical area

2 from the midbrain: rubro-spinal tract & tecto-spinal tract

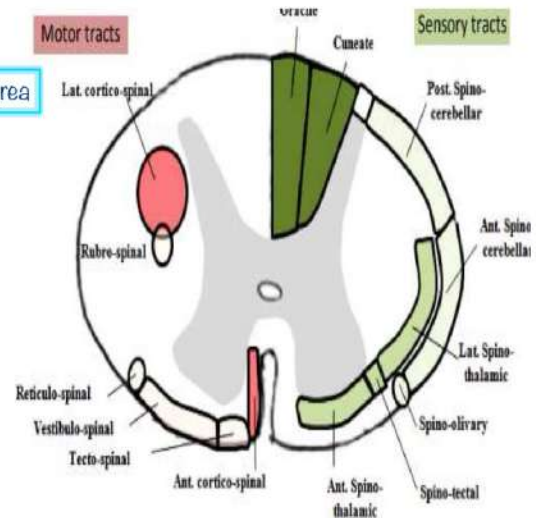
2 reticulo-spinal tracts: medial & lateral

2 Vestibulo-spinal tracts: medial & lateral

Olivospinal tract.

III. Intersegmental tracts

(proprio-spinal): Surround the grey matter forming the fasciculus proprius anterior, lateralis & posterior. Contains ascending and descending short axons of interneurons between adjacent segments of spinal cords



يعني segment بيعت لل segment الي تحته او الي فوقه حناخدها اكثر ب الفسيو بال reflex يعني sensory neuron بلقط ال sensation و بيعت امر لل motor على طول يعمل reflex بدون الحاجة انه ال sensation يطلع لل brain و يعطي ردة فعل ال intersegmental بسمح ب reflex سريع راح بيعت لل brain انه حصل كذا ولكن مش ال brain الي تصرف

- **Posterior spino cerebellar tract**
- Carries proprioception from the **lower limb & trunk**.
- The central processes of DRG cells enter the spinal cord via the dorsal root to end on **ipsilateral Clarke's nucleus**.
- The tract ascends **ipsilaterally** in the lateral white column, posterior to the anterior spinocerebellar tract enters the **ipsilateral cerebellum** via the inferior cerebellar peduncle (ICP).

- **Anterior spinocerebellar tract**
- Carries proprioception from the **lower limb**.
- The central processes enter the spinal cord via the dorsal root to end on Clarke's nucleus. -

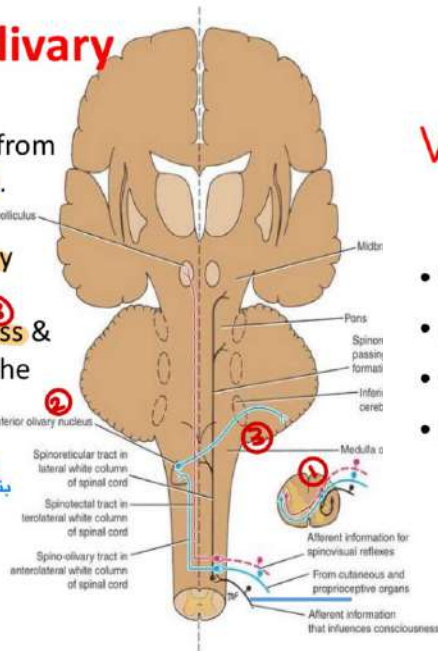
Axons forming the tract mostly decussate but few remain ipsilateral.

then **cross again** to reach the ipsilateral cerebellum They enter the cerebellum via the **superior cerebellar peduncle (SCP)**

Spino-olivary

- It carries proprioception from **both upper & lower limbs**.
- **Fibers cross**
- End in **contralateral olivary nucleus**
- Olivocerebellar fibers **cross & pass via the ICP** to reach the **ipsilateral cerebellum**.

١ يتلف مكانها ويتطلع لقوق ويتكمل لتوصل ل ٢ شوفوا الترقيم مع المعومات والصورة



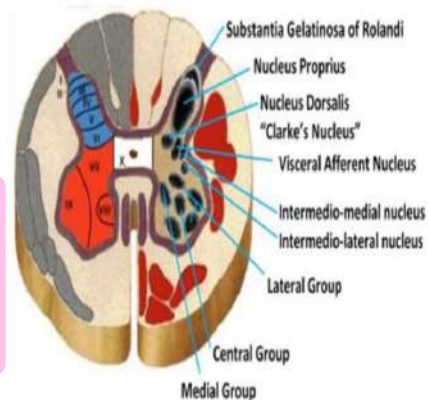
Ventral spinothalamic

- Carries **touch and pressure**, lies in anterior white column
- Begins from **lamina IV-VII**
- Cervical fibers are medial
- End on VPL

Lateral Spino-thalamic Tract

- Carries **pain and temperature**, it lies in lateral white column
- Begins from lamina I, IV, VIII
- Lamination cervical fibers are medial
- End on VPL of thalamus

عدلوها ل 2,3 lamina سالت الدكتور عنها حكالي follow the physiology



T6 in thoraces - neck - cervical.
End in el

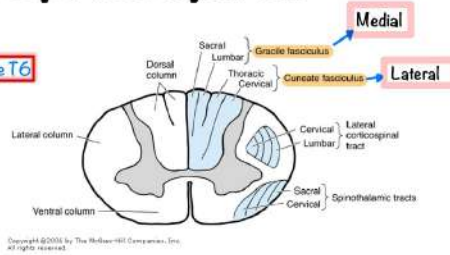
The head has cranial nerves not control by T6

Gracile & Cuneate tracts Posterior column tracts conscious proprioception

- conscious proprioception (sense of position, sense of movement and sense of vibration)

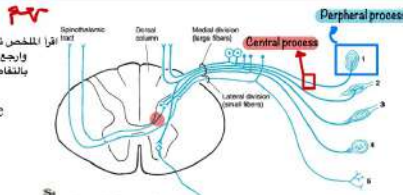
Gracile carry from lower part below T6

- Fine touch (tactile discrimination, tactile localization and stereognosis)



First Neuron: Dorsal Root Ganglion cells which are pseudounipolar. Their peripheral processes carry sensations from deep receptors (in muscles, tendons & joints).

Their central processes pass to the spinal cord via the dorsal root. Fibers from the lower part of the body (below T6) ascend medially in the dorsal column forming the gracile tract. Fibers from the upper part of the body (above T6) ascend laterally in the dorsal column forming the cuneate tract. Lamination: sacral fibers are most medial & cervical fibers are most lateral. With gracile

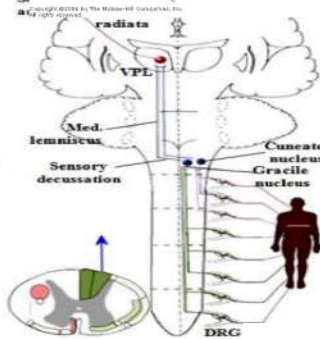


Second Neuron: Gracile & Cuneate Nuclei of the medulla oblongata. Axons of these nuclei cross the median plane (forming the internal arcuate fibers (sensory decussation)). Fibers ascend in brain stem as the medial lemniscus in the opposite side to reach the thalamus.

Some cervical fibers end on the accessory cuneate nucleus (posterior to the cuneate nucleus), its axons (cuneo-cerebellar fibers) pass to the cerebellum.

Third Neuron: Ventral posterolateral Nucleus of thalamus (VPLN). Axons of these cells pass through posterior limb of internal capsule, then through corona radiata to reach sensory area of cerebral cortex.

The internal capsule has upper limb - lower limb - genu



Pathway of crude touch & pressure

First neuron: Peripheral processes of these cells carry touch & pressure from the receptors & Central processes of dorsal root ganglia enter spinal cord via dorsal root end on lamina IV-VII

Second neuron:

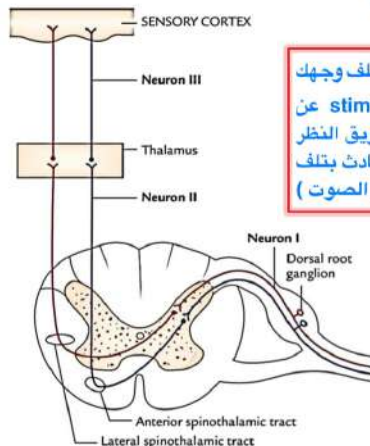
- Axons of lamina cross in ventral white column ascend as ventral spinothalamic tract, cervical fibers are medial
- Ascends in brain stem, joins medial lemniscus
- Reach VPL of thalamus

Third neuron:

- fibers of VPL Pass in posterior limb of internal capsule
- Reach sensory area of cerebral cortex

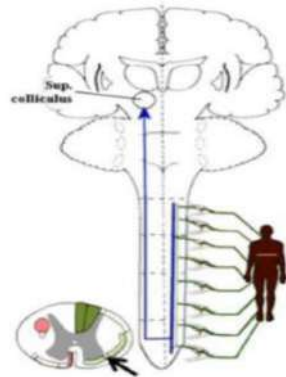
Note: Not all spinothalamic fibers end on VPLN of thalamus, some fibers end on intralaminar nuclei and midline nuclei. These fibers are probably involved in arousal behavior.

Sacral fibers lateral and cervical fibers medial



Spino-tectal

- In lateral white column
- mostly Crossed
- End in superior colliculus of mid brain
- Head turning towards source of pain



زي لما حد يضربك وانت مش منتبه بتلف وجهك تلقائي باتجاهه وهيك يكون ال stimulus عن طريق الجلد وممكن يكون عن طريق النظر او السمع (لما تسمع صوت خبطة او حادث بتلف عليه تشوف مصدر الصوت)

Pain pathway

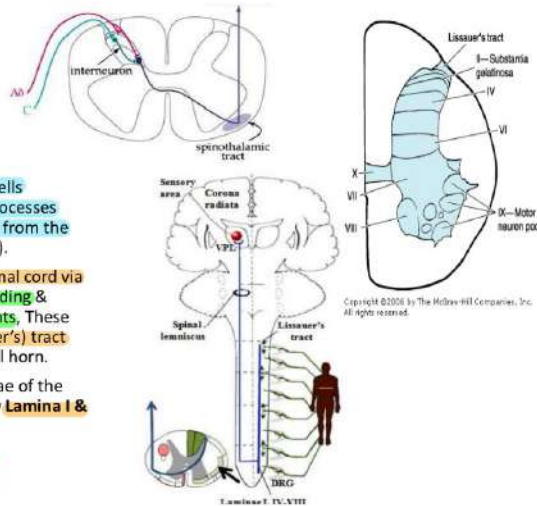
Lateral Spino-thalamic Tract

First neuron : Dorsal root ganglion cells (pseudounipolar) Their peripheral processes carry pain & temperature sensations from the receptors (free nerve endings in skin).

Their central processes enter the spinal cord via the dorsal root and divide into ascending & descending branches for few segments. These fibers run in the dorsolateral (Lissauer's) tract which lies over the apex of the dorsal horn.

They end on neurons in many Laminae of the grey matter of the spinal cord mainly Lamina I & IV - VIII

الأخضر مش مهم



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Source: DECIPHER

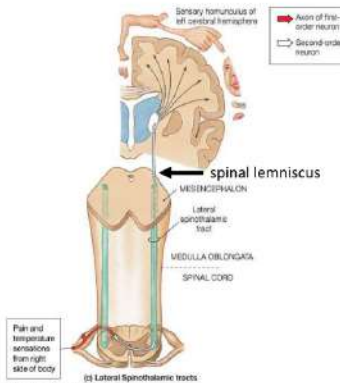
Second neuron :

Neurons in Laminae I, IV-VIII of grey matter of spinal cord. Axons of these neurons cross to the opposite side in the ventral commissure & ascend in the lateral white column as the lateral spinothalamic tract. As the tract ascends, its fibers are laminated so that cervical fibers are most medially and sacral fibers most laterally.

The tract ascends in the brain stem as the spinal lemniscus.

It reaches the thalamus where it ends on VPLN of thalamus.

Third neuron : Axons of VPLN pass in posterior limb of internal capsule to reach sensory area



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Pain & temperature from the face

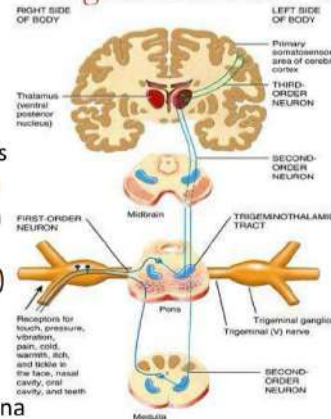
is carried by the trigeminal nerve.

1. **First Neuron** is Trigeminal Ganglion (formed of pseudounipolar cells as DRG)

2. **Second Neuron** is Spinal Nucleus of Trigeminal. Its axons cross to opposite side forming trigemino-thalamic tract which ascends to end on the ventral posteromedial nucleus (VPMN) of thalamus

3. **Third Neuron** is VPMN of thalamus whose axons pass in internal capsule, then the corona radiata to reach sensory area of face in cerebral cortex.

Trigeminothalamic Pathway

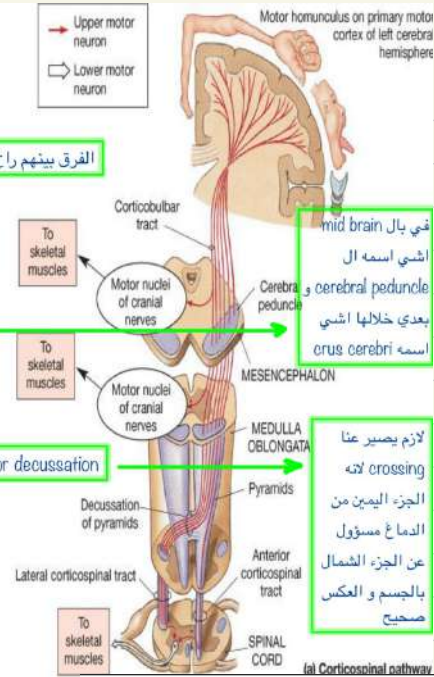


Conveys nerve impulses for most somatic sensations from the face, nasal cavity, oral cavity and teeth to the cerebral cortex.

Figure 16.07 Tortora - PAP 12/e Copyright © John Wiley and Sons, Inc. All rights reserved.

To the Genu

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



Pyramidal tract الفرق بينهم راح ناخذة 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

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

لازم بصير عنا ال crossing ال الجزء اليمين من الدماغ مسؤول عن الجزء الشمال بالجسم و العكس صحيح

Motor decussation

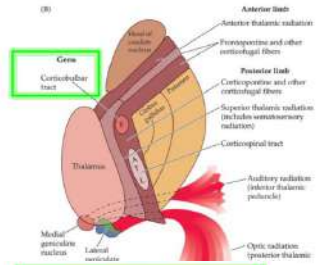
مسؤول عن ال الحركات بالجسم عن ال limbs و الحركات الي بتتطلب skills

Cortico bulbar

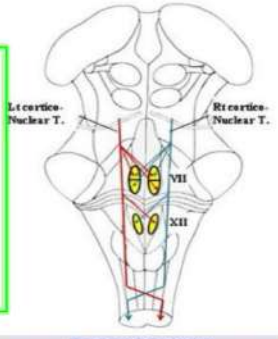
cranial nerves ال او cortico cranial لاتها بتغذي ال

- Some pyramidal fibers end on motor nuclei of cranial nerves present in brain stem
- All cranial nerve nuclei receive bilateral corticobulbar except هاد الاشي يعني انه صعب يجيلهم شلل لانه ال supply bilateral
- **Facial nucleus** that supplies muscle of lower part of face
- **Hypoglossal nucleus** that supplies genioglossus

Both receive **contra lateral supply only**



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



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 6 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.

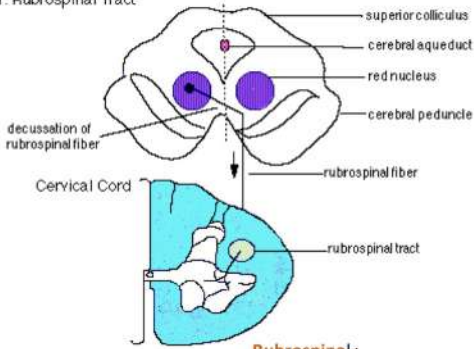
- **Rubrospinal** → Rubro means red » named red nucleus situated in mid brain
- **Tectospinal** → في اشي بال mid brain اسمه ال tectum و جواه في اشي اسمه ال superior colliculus بتطلع منه
- **Medial vestibulospinal**
- **Lateral vestibulospinal** → bones ال vestibular nucleus موجودة بالدماغ مسؤولة عن الاتزان بال
- **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

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

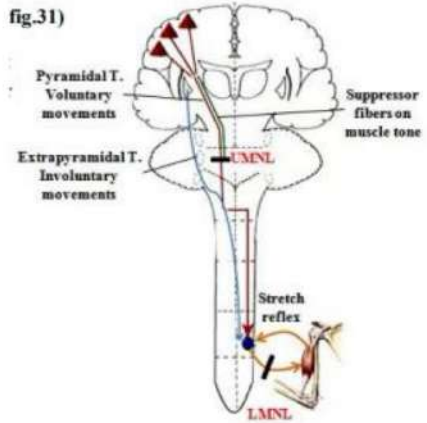
1. Rubrospinal Tract



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

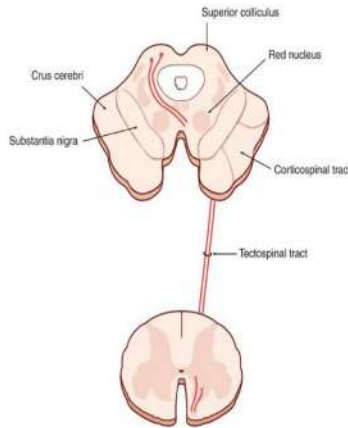
fig.31)



هاد الحكي بالنسبة لل spinal cord اما
 cranial nerve عننا brain stem
 و بتعاملها نفس معاملة ال
 nuclei damage يعني لو ال
 upper neuron الي قبلها يكون
 lower اذا فيها او ب الي تحت يكون

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



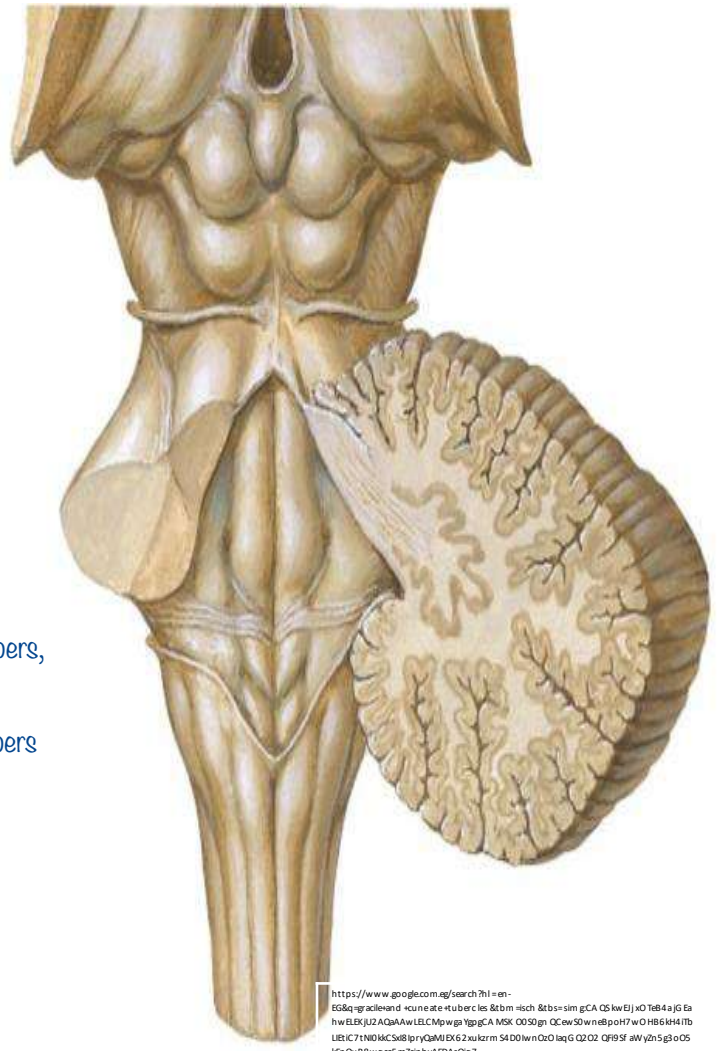
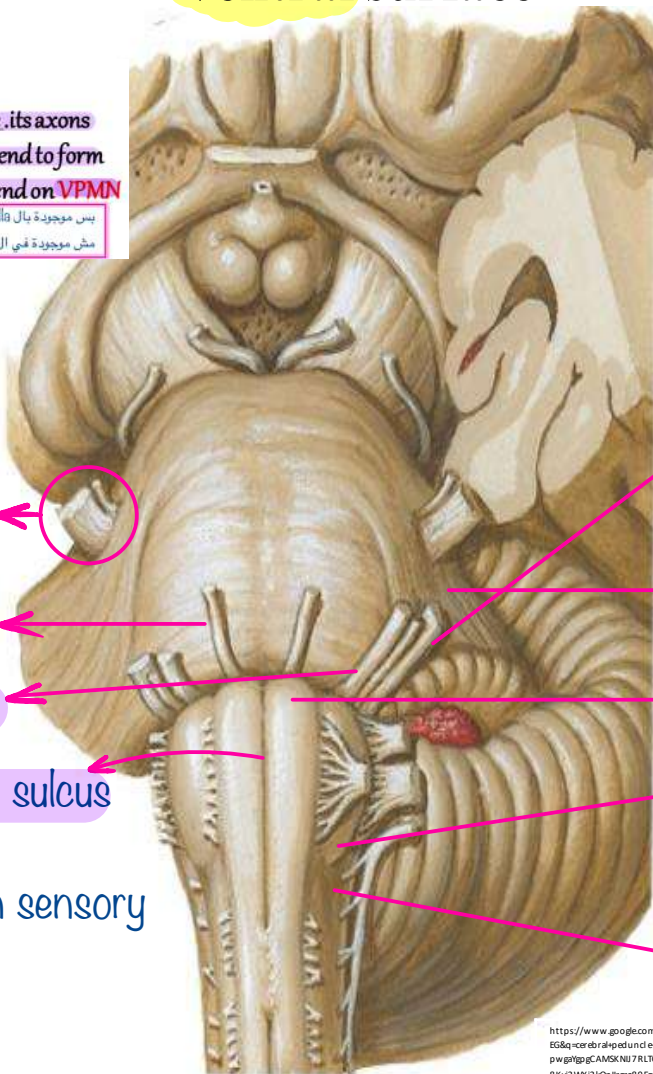
يعني حدا ضربيني او خبطيني او اجا صوت عالي
 فجأة او السما ضوت من رعد او اشي كل هاي
 الاشياء راح تخليك تلتقت ناحيتها و هاد الجزء
 المسؤول عن حركة ال head and neck بيهيك حالات

	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. شلل الأطفال
Movements	Only voluntary information movements are lost while the involuntary & emotional movements are intact i.e. it is Paralysis of movement يعني مثلا لو حكيت للمريض اضحك ما راح يقدر اما لو صار موقف قدامه بضحك بقدر يضحك لا ارادي	All movements are lost & the muscle cannot be moved by any means i.e. it is Paralysis of muscle محشورة بالمكان الصغير هاد ف اذا صار بجزء صغير منها جلطة او نزيف راح تبين على طول و يصير اشي اسمه hemiplegia يعني شلل نصفي تذكروا لو جهة اليمين خربت الشلل يكون بجهة الشمال بالجسم
Muscle tone	Clasp knife spasticity occurs due to interruption of inhibitory fibers (from area 4 S) which suppress the stretch reflex arc Continuous contraction of the muscle without any voluntary action	Hypotonia [flaccidity] occurs due to Interruption of the stretch reflex arc يعني لما تيجي تفتح ايد المريض بتشد بتشد بالعافية بتفتحها بتكون ايده مخشبة
Tendon jerks	Exaggerated & clonus may occur.	Lost.
Superficial reflexes	Abdominal & cremasteric reflexes are absent راح ناخذها بالكينيكال	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 (ممكن نشوفها بالناس الي بتنام نوم عميق جدا او بالاطفال	Lost N.B: the normal plantar response is flexion of all the toes
Atrophy	Does not occur	Disuse atrophy occurs

The Brain Stem

Ventral surface

Dorsal surface



Mid Brain

Pons

Medulla Oblongata

Vestibulo-cochlear 8th

Middle cerebellar peduncle

Pyramid

Formed by corticospinal fibers, pass to cerebellum forming interior external arcuate fibers

Olive

Inferior cerebellar peduncle

Sensory larger than motor

Trigeminal 5th

Abducent 6th

Facial 7th

Anteromedian sulcus

Motor larger than sensory

Spinal nucleus of trigeminal:

Carries pain and temp. from face. its axons cross to the opposite side and ascend to form the trigeminal lemniscus which end on VPMN of thalamus.

بس موجودة بال upper part of the medulla
مش موجودة في ال crossed medulla

Ventral Surface of the Brain Stem

Mid Brain

Transverse pontine ridges

Basilar sulcus » basilar artery

Pons

9th glosso-pharyngeal

10th vagus

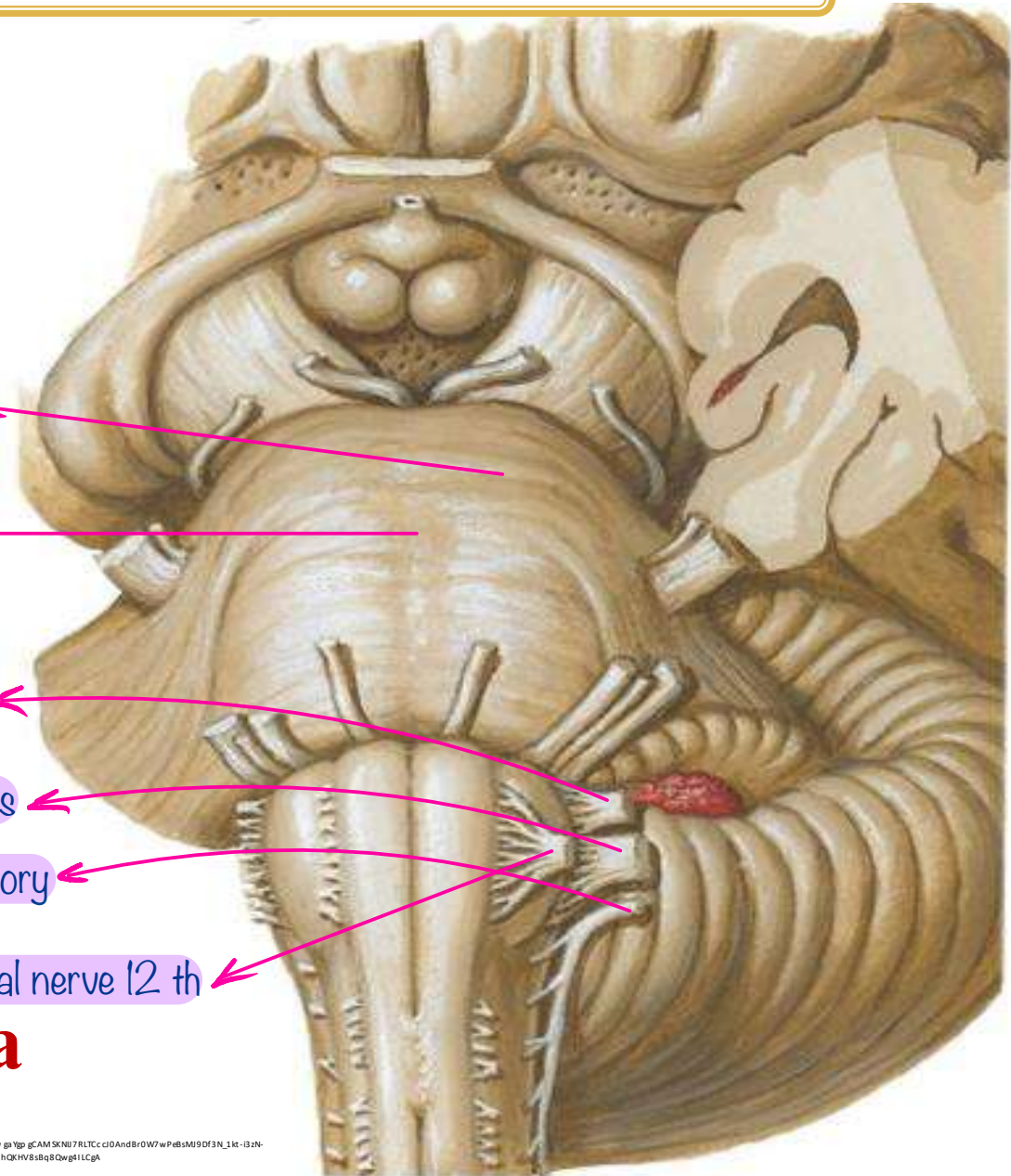
11th accessory

Hypoglossal nerve 12th

Cerebello-pontine angle »

between cerebellum and pons

Medulla Oblongata



Mid Brain (Inter-peduncular Fossa)

➤ Boundries:

1. Anteriorly: optic chiasma.

2. Anterolaterally: optic tract.

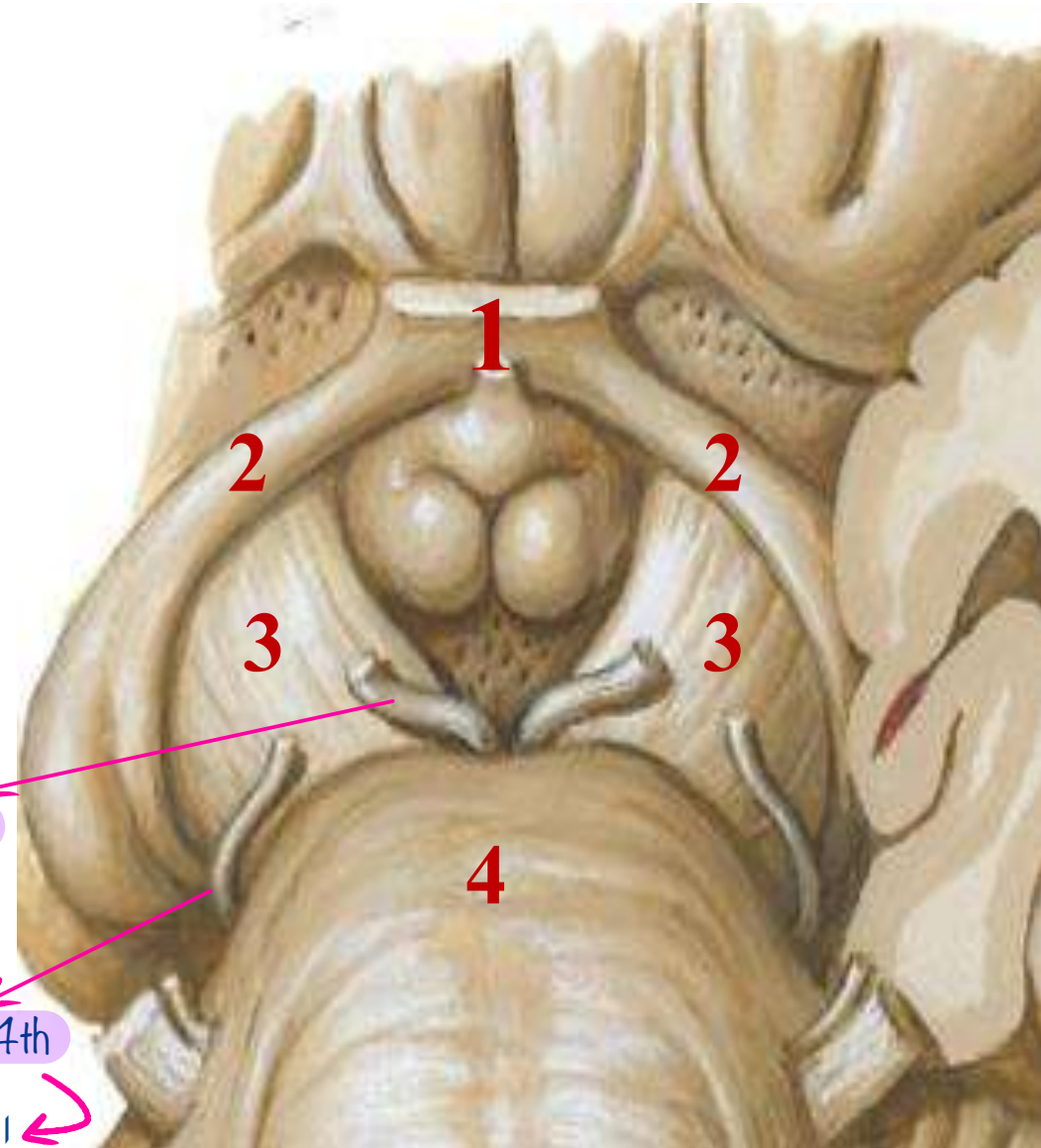
3. Posterolaterally:

cerebral peduncles. Occulomotor nerve

4. Posteriorly: pons.

Trochlear nerve 4th

ال nerve الوحيد الي طالع من ال dorsal



Mid Brain (Inter-peduncular Fossa)

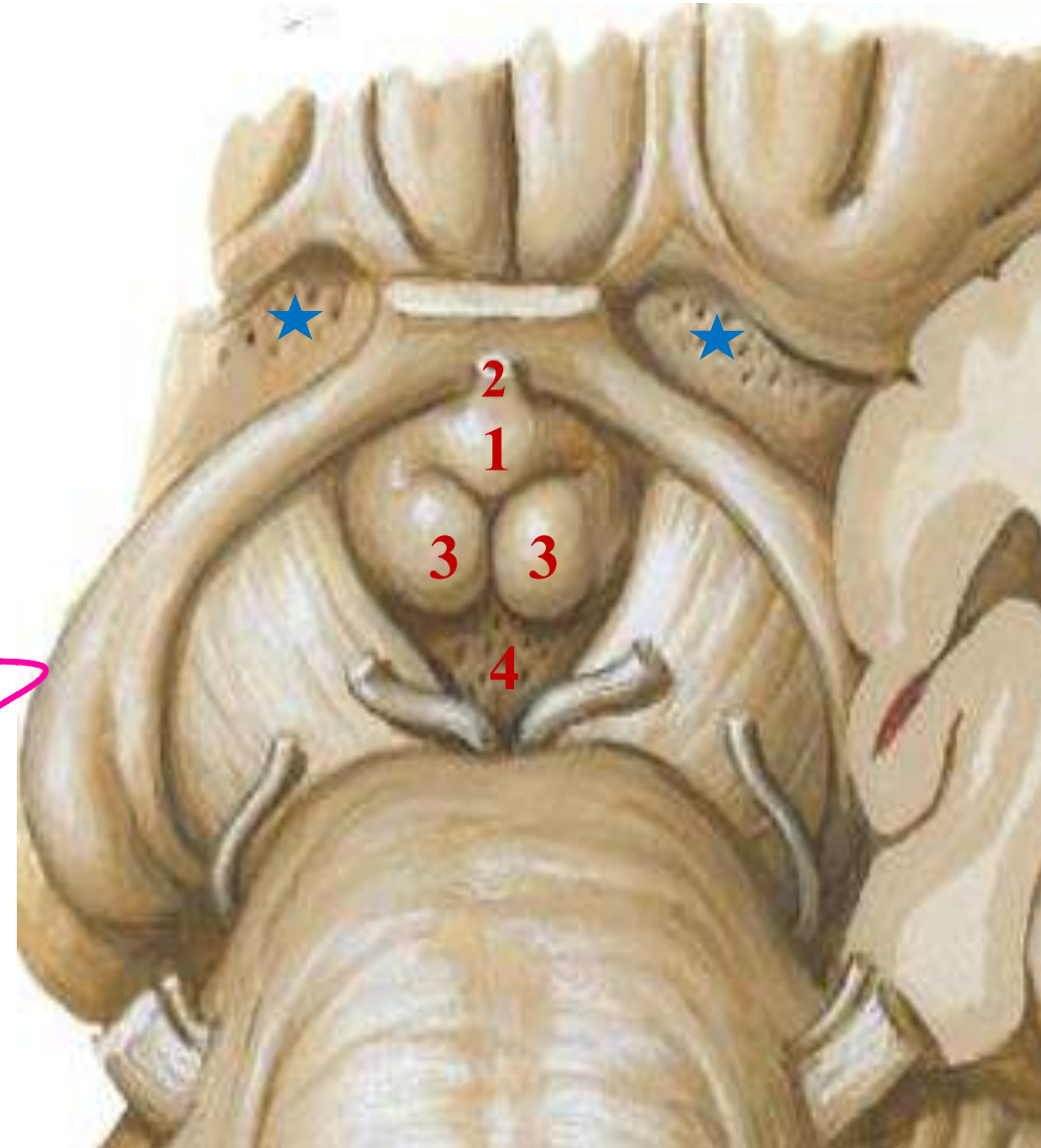
➤ Contents:

1. **Tuber cinereum**
2. **Infundibulum**
2. **Mammillary bodies**
4. **Posterior perforated substance**

Central branches of posterior cerebral arteries

Notice: anterior perforated

substance (★)

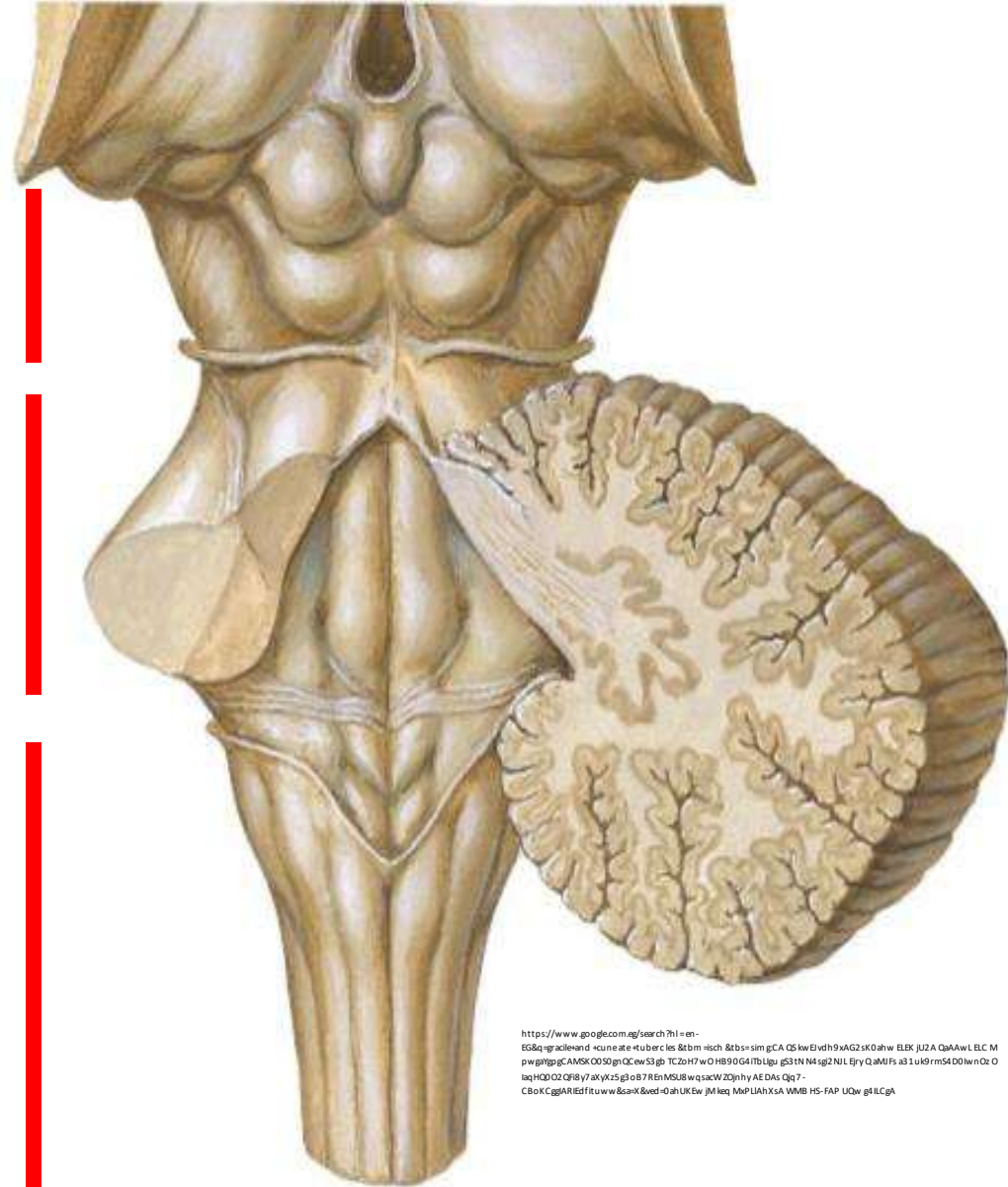


Dorsal Surface of the Brain Stem

Mid Brain

Pons

Medulla Oblongata



https://www.google.com/eg/search?hl=en-EG&q=gracile+and+cuneate+tubercles&btn=h&sim=CAQ5kwEivd9xAG2xK0ahw_ELBKJUZAQaAAwLELCMpwpnpgcAMSK0050gnQcawS3gbTCzoH7wOH890G4TbLgu_g531N4sg2NLEgryQaMf5ad1uk9rm54D0wnOzOlxH00O2QF8y7axYx5g3ob7RnMSU8wqasacWZ0nhyAEDAsCq7-CBoXCggARtdftuww&sa=X&ved=0ahUK6wJMteqMPLAHXSAWMBHS-FAPUQw_g4ILCg

Dorsal Surface of the Mid Brain

➤ Identify:

Visual reflex » connected to LGB

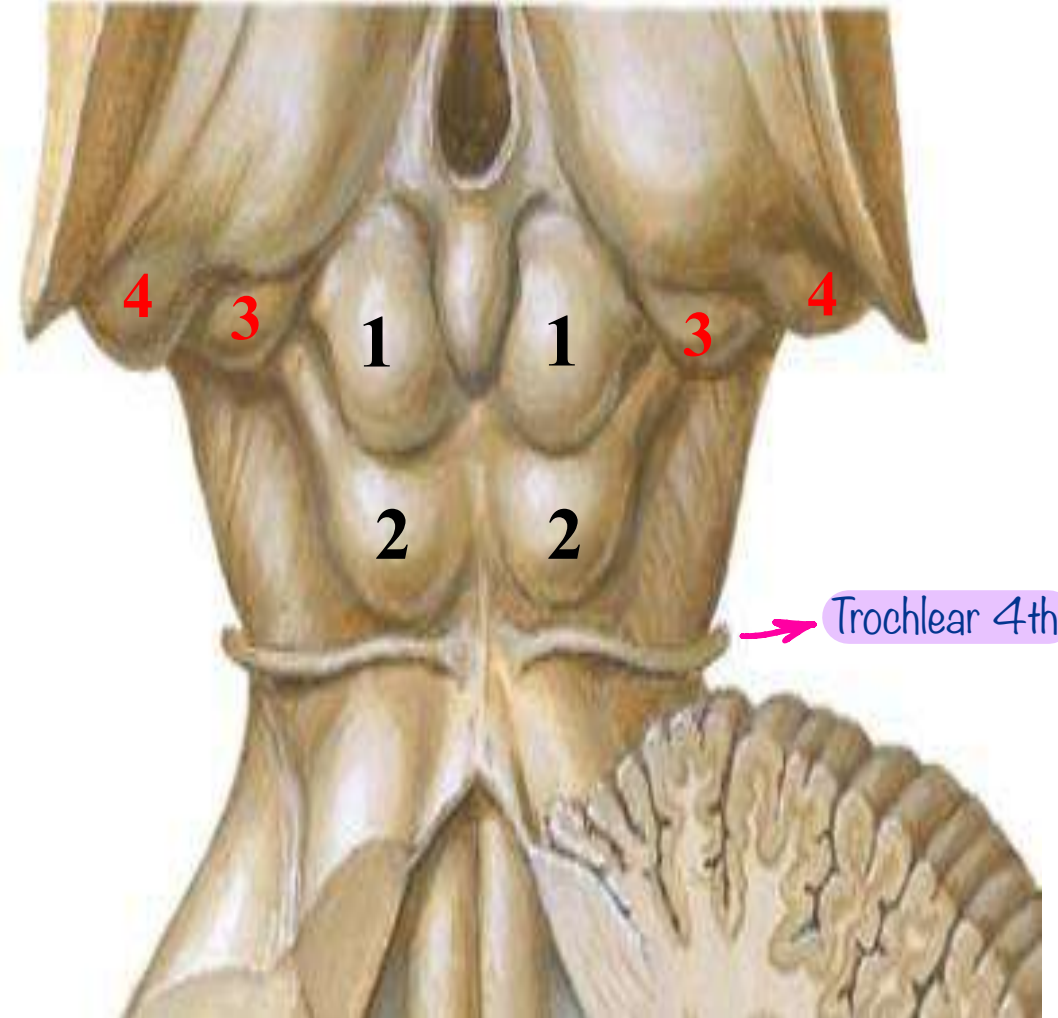
1- **Superior colliculus** ↗

2- **Inferior colliculus** ↘

Auditory reflex » connected to MGB

3- **Medial geniculate body (MGB)**

4- **Lateral geniculate body (LGB)**



Dorsal Surface of the Pons

(Upper part of 4th ventricle)

➤ Identify:

- **Medullary stria (MS)**

- **Median sulcus**

Overlies the abducent nucleus

- **Medial eminence (me)**

- **Facial colliculus (fc)**

Motor fibers of facial never overlying the abducent nucleus

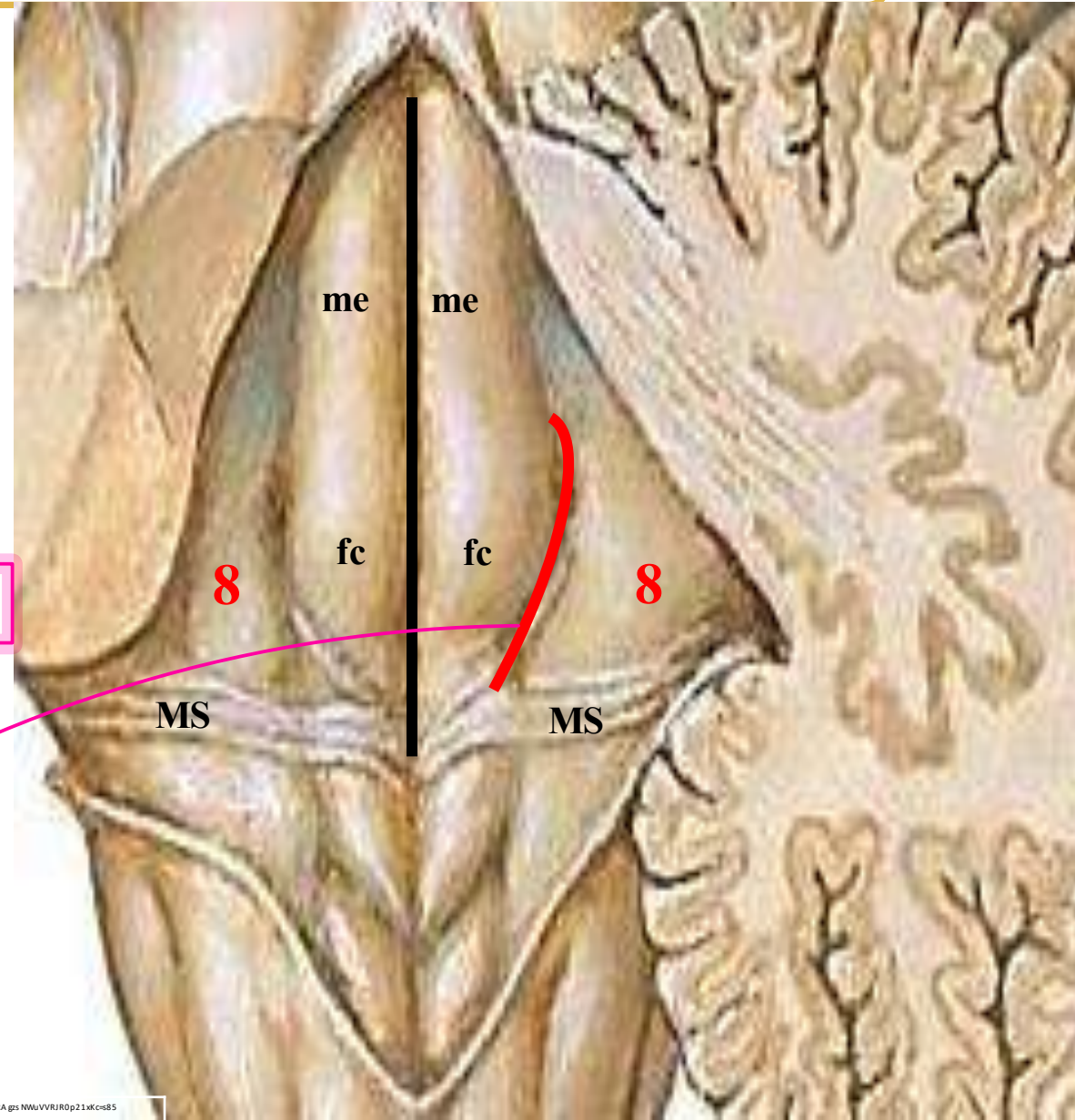
- **Sulcus limitans**

- **Locus ceruleus**

- **Superior fovea**

Between facial colliculus and vestibular area

- **The vestibular area (8)**



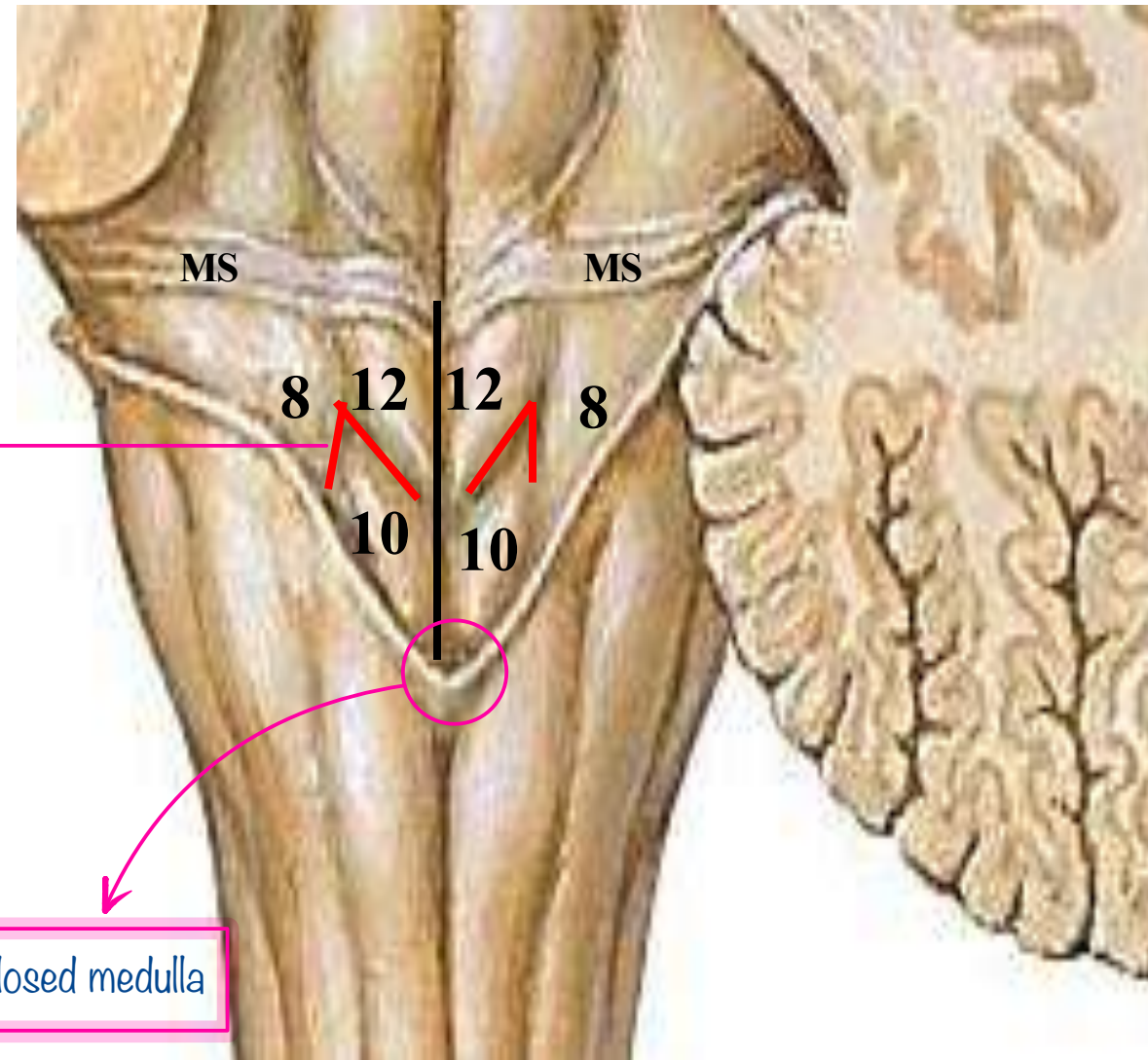
Dorsal Surface of the Opened Medulla Oblongata (Lower part of 4th ventricle)

➤ **Identify:**

Separates medulla from pons

- **Medullary stria (MS)**
- **Median sulcus**
- **Inferior fovea (inverted V-shaped depression)**
- **Hypoglossal trigone (12)**
- **Vagal trigone (10)**
- **Vestibular trigone (8)**

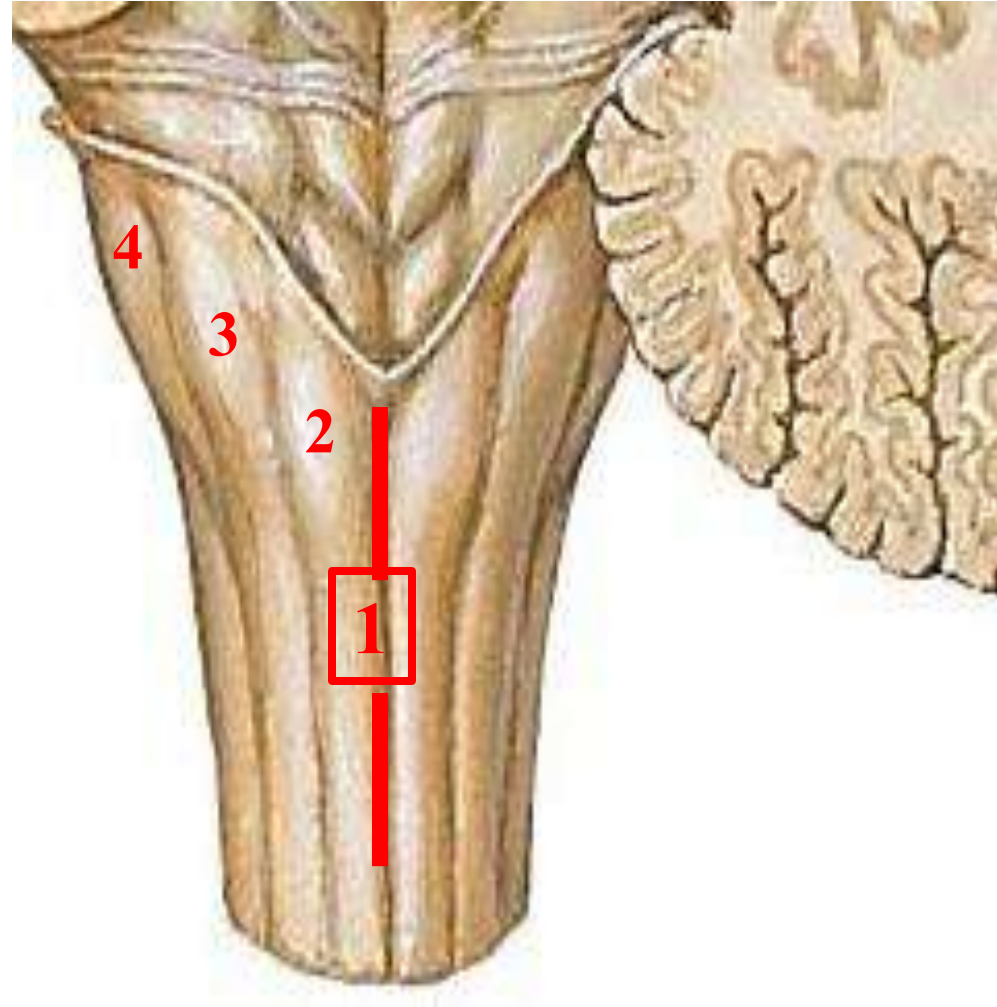
Apex continuous with central canal of closed medulla



Dorsal Surface of the Closed Medulla Oblongata

➤ Identify:

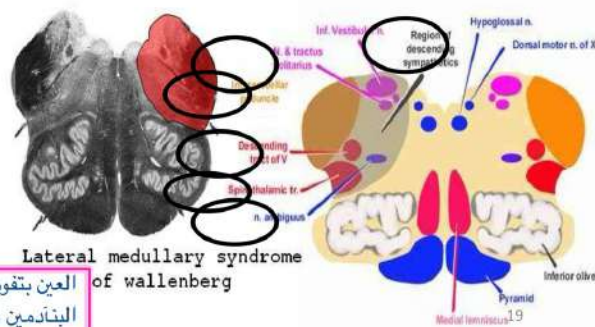
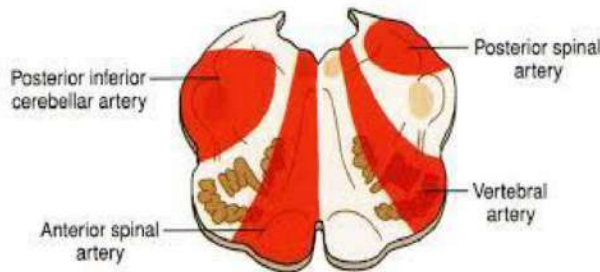
- 1- Posterior median sulcus
- 2- Gracile fasciculus
- 3- Cuneate fasciculus
- 4- Inferior cerebellar peduncle (ICP)



I Lateral medullary syndrome

PICA occlusion.... **Lateral medullary syndrome** which involves the following:

- a. Spino-cerebellar tract & ICP.... **cerebellar ataxia.**
- b. Spinal N. & tract of V**loss of pain & temp. from ipsilateral face.**
- c. Spinal lemniscus ...**loss of pain & temp. from opposite half of body.**
- d. Nucleus ambiguus **ipsilateral paralysis of palate, pharynx, larynx.**
- e. Nucleus solitaries.....**loss of taste sensation.**
- f. Descending sympathetic fibers ...**ipsilateral Horner's syndrome (ptosis, miosis, anhidrosis, enophthalmos).**



↖ Dropping of the eye lid
↖ Pupil constriction
↖ No sweating
↖ العين بتفتوت لجوة بس ما بتظهر على البنادمين بس على الحيوانات بالتجربة

بس بالtheoretically لازم بيين لازم يكون bilateral ما راح يحكيك المريض حاسس بالطعم بجهة و جهة لا

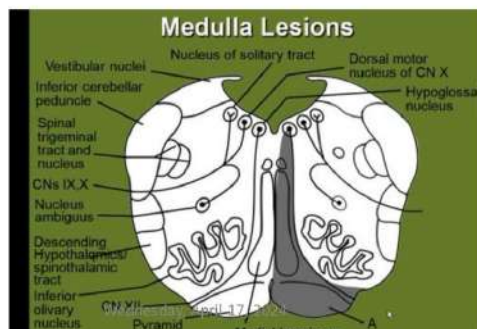
I Medial medullary syndrome

Occlusion of anterior spinal artery

- Pyramid ...??
- Medial lemniscus...??
- XII nucleus...??



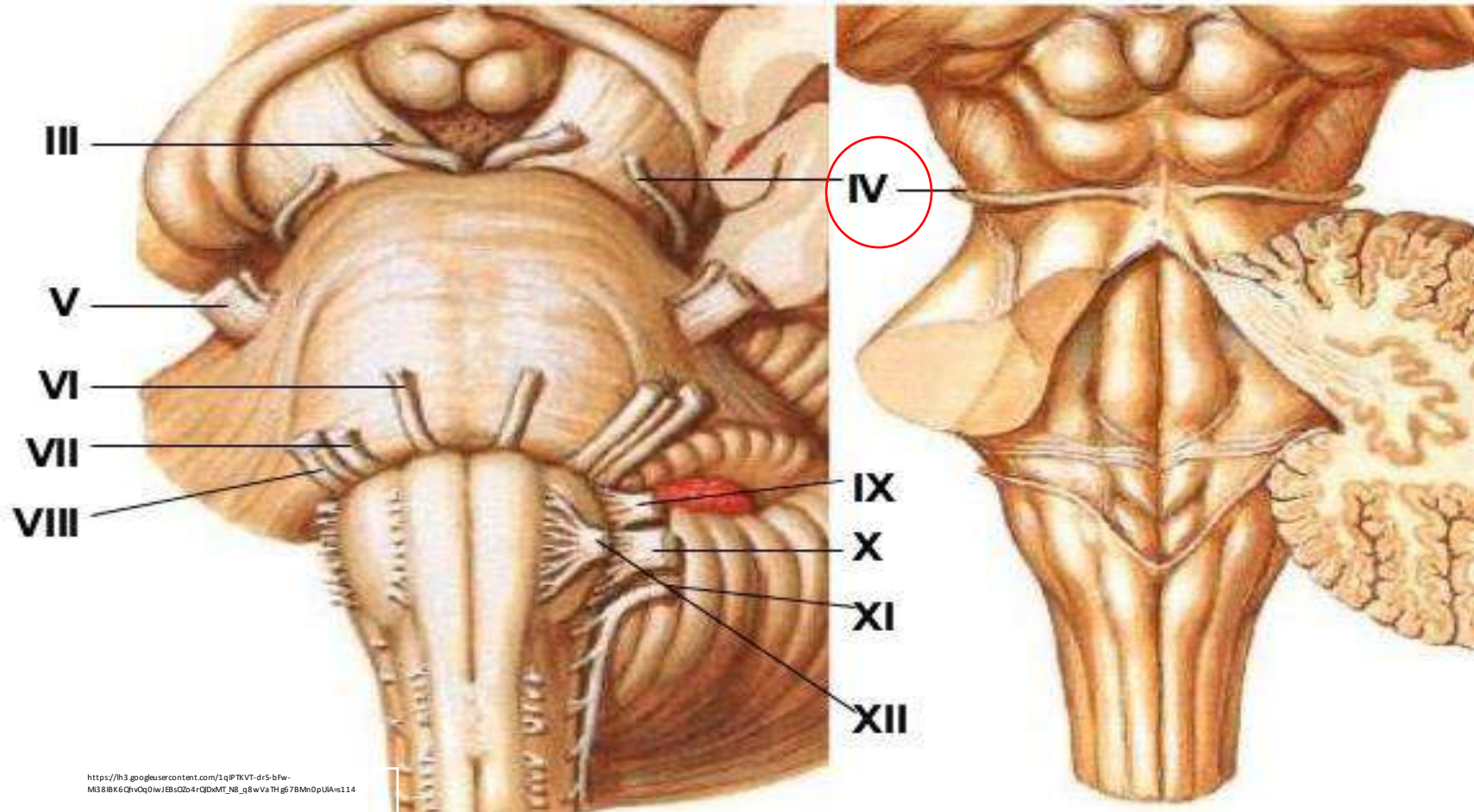
Upper motor neural lesion



- a. Pyramid ; **contralateral hemiplegia of the UMNL type** ↖ flaccid paralysis?? ↖ راح تنشرح بال stroke بال internal capsule
- b. Medial lemniscus : **contralateral loss of proprioception & fine touch** ↖ Lower motor neural lesion
- c. XII nucleus : **ipsilateral LMNL paralysis of tongue muscles** (ask patient to protrude tongue, it deviates towards paralyzed side). **Crossed hemiplegia???**

Cranial Nerves Exit

- All cranial nerves have nuclei of origin in brain stem **Except I & II**
- All cranial nerves emerge from ventral surface of brain stem **Except trochlear nerve IV**
- All cranial nerves do not cross to the opposite side **Except trochlear nerve IV**

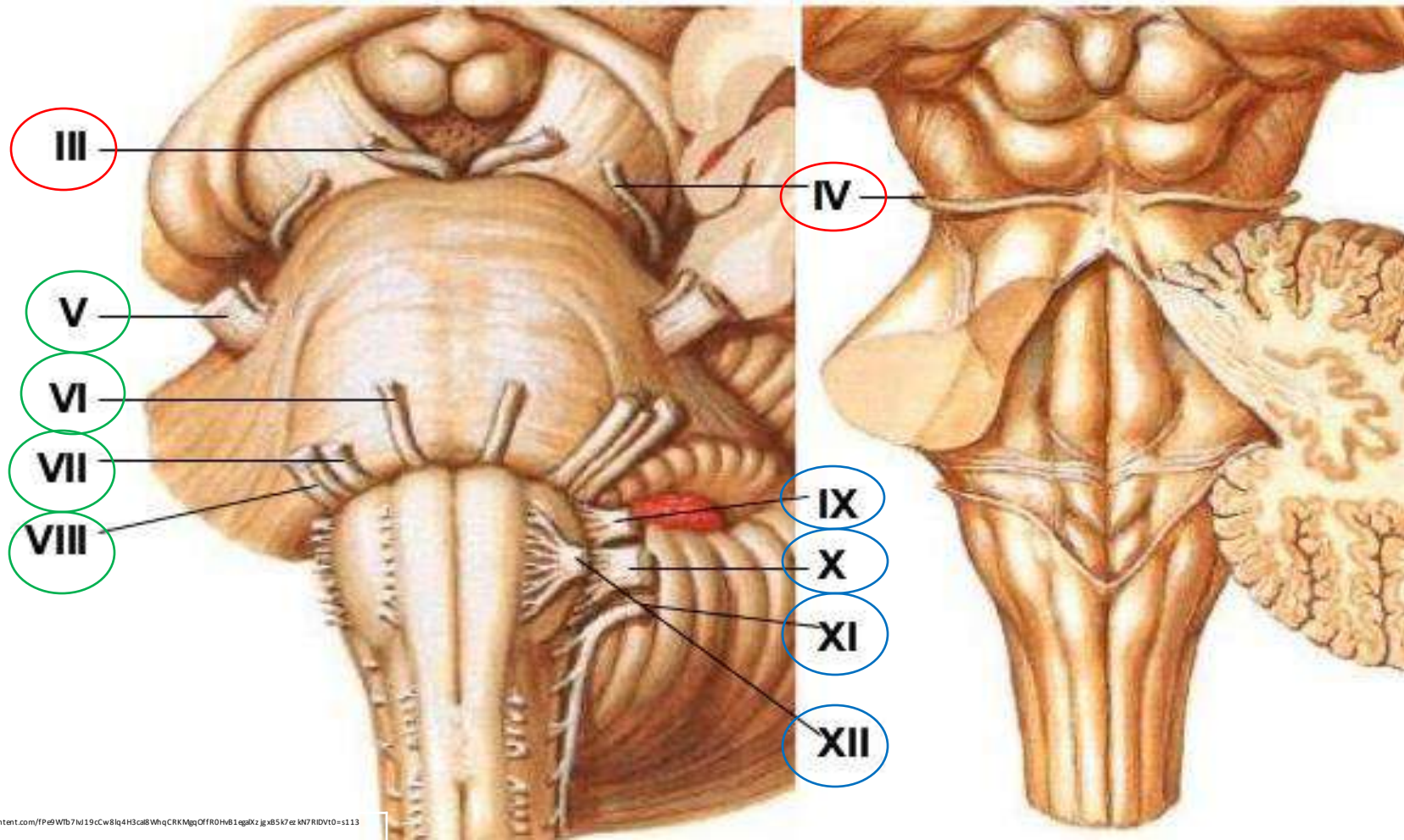


Cranial Nerves Exit

III & IV cranial nerves emerge from the midbrain

V, VI, VII & VIII emerge from the pons

IX, X, XI, XII emerge from the medulla oblongata



THANK YOU