

NEUROANATOMY

OSPE

DONE BY: عادل الشهري _ هديل الغرير_ روان الضويحي

*With appreciation to
Abdulrahman Alkaff, Dr. Shimaa Mahmoud &
Dr. sahar shareef for their significant efforts*

Sources:

[-prof Ahmed Fathallah practical revision file](#) المصدر الاساسي الي حاولنا مانطلع منه كثير

-Teams 434,433,431,430

-neuroanatomy by Crossman(book)

-Teachmeanatomy (website)

-Kaplan book

-EXTRA information

-Dr.shimaa's Notes

-prof.Ahmed fathallah's Notes

-prof.abulmakarem's Notes

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- The exam is composed of 7 questions:
 - 5 Anatomy
 - 1 Histology
 - 1 Radiology: 1 CT or 1 MRI
- with exeption of histology all qs in form of small scenario.
- Please read the question before answering because not all the questions are just identification.
- There is a difference between the name of gyrus (e.g. precentral gyrus) and the name of the functional of area (e.g. primary motor area)
- **The illustrations in these slides are not necessarily those will be present in the exam.**
- The information you have obtained for MCQ exam are more than enough for OSPE.

Test Yourself.

ملاحظه:

اضافه من عبدالرحمن الكاف دفعة 434

لمحاولة محاكات نمط الاختبار **وليس موجود** في ملف البروف احمد

SPINAL CORD

YOU SHOULD:

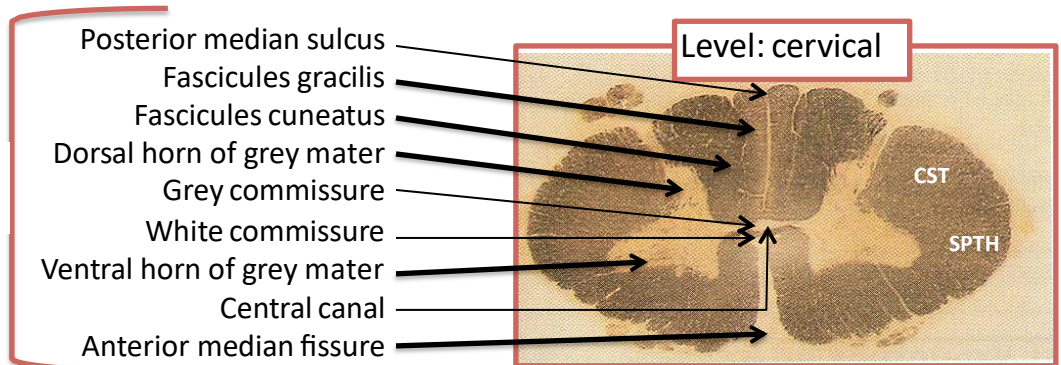
-Identify the level

-Identify all structures seen in the slides

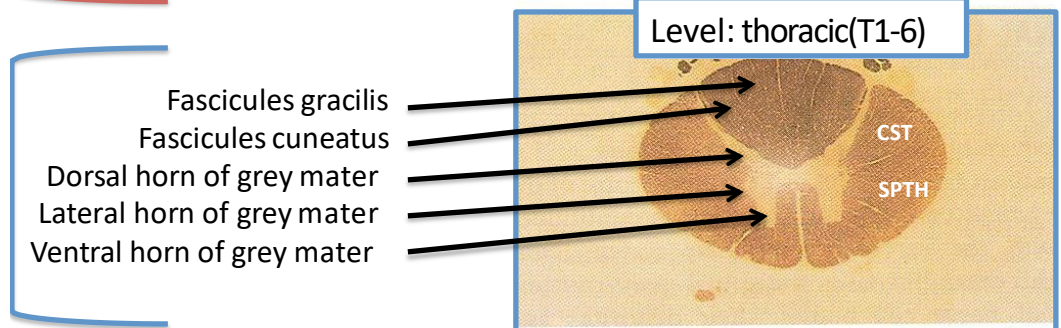
CST:corticospinal tract

SPTH:spinothalamic tract

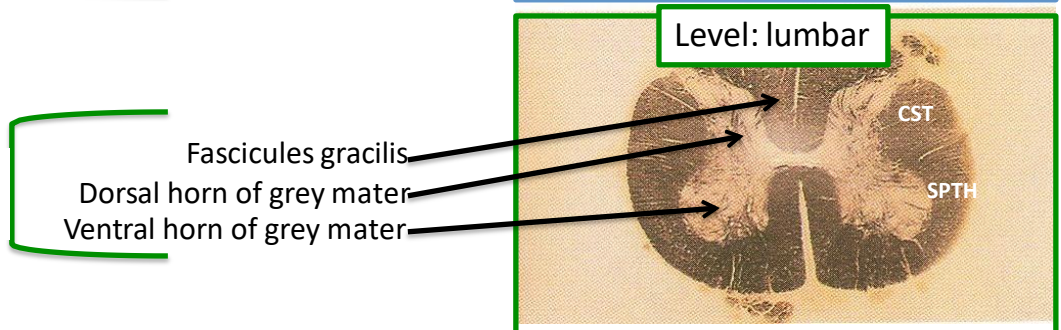
Note: no lateral horn



Note: there is both fasciculus gracilis (lower limb) and cuneatus (upper limb) in this section so it must be above T6



Note: **no** fasciculus cuneatus



#Focus on how to differentiate between the levels (appearance of cuneatus, lateral horn,...)

#mostly Lumbar level isn't important.

HOW TO DIFFERENTIATE BETWEEN SP CORD SEGMENTS?

-if the lateral horns present >the section from thoracic.

-cervical section has very thin dorsal horn in comparison with lumbar section

cervical section:
oval, has FG & FC

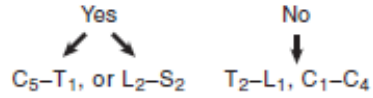
Thoracic section:
round, has FG & FC, lateral horn. Grey matter is few because no plexuses formation.

Lumbar section:
round to oval, has FG only,

Extra page for better understanding

Features to look for to identify a cord section:

- Is there a large ventral horn?



- Are both dorsal columns present?



- Is there a lateral horn present?

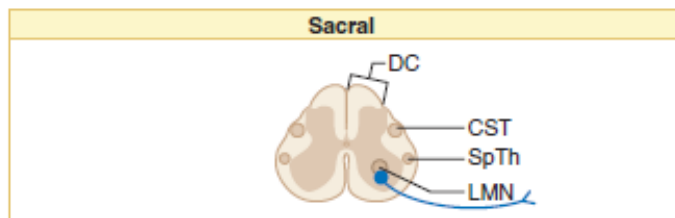
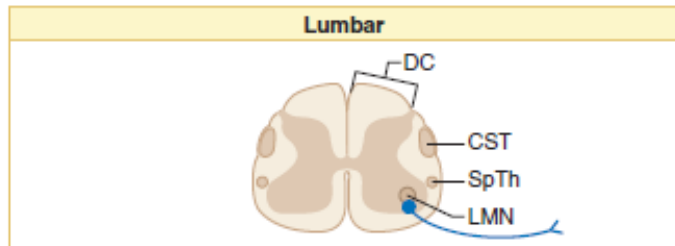
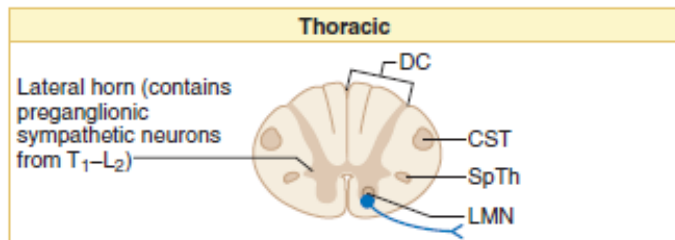
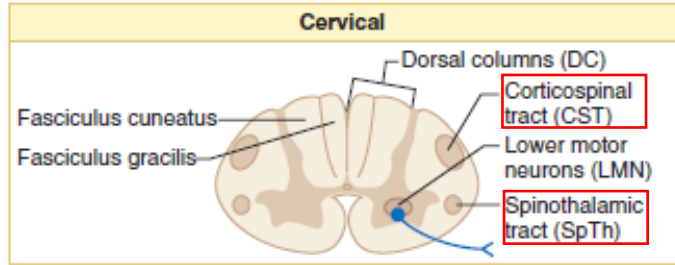
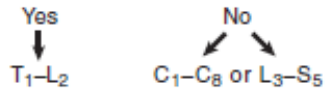


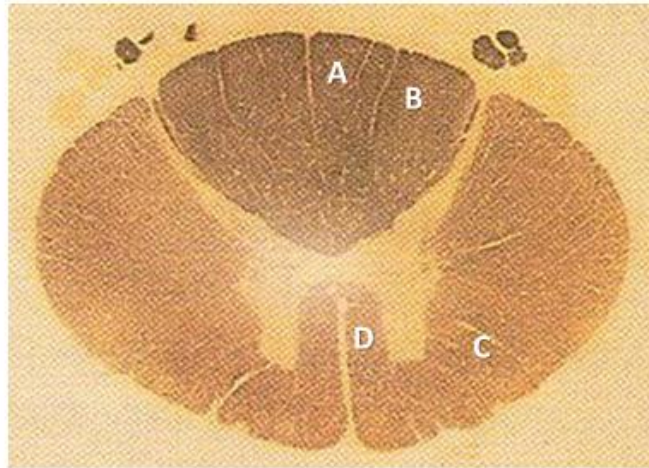
Figure III-4-16. Spinal Cord: Levels

Test Yourself. About Spinal Cord

Q1:

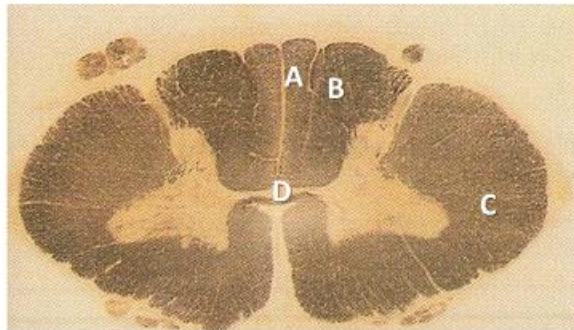


A patient was diagnosed as a case of syringomyelia



1. What is the level of the section shown?
2. What is the name of the tract affected in the case above?
3. What is the letter corresponding to the tract affected in the section?

Q2:



- 1) What is the level of the section shown?
- 2) A boy has lost proprioception sensation in lower limb. which tract is affected? & What is the letter corresponding to the tract affected?
- 3) A patient is presented with loss of sensation in the upper limb, what is the affected structure? & What is the letter corresponding to the tract affected?
- 4) Loss of pain and temperature is because of a lesion in which of the labeled areas?



ANSWERS

AQ1: 1) Thoracic. 2) Spinothalamic. 3) C.

AQ2: 1) cervical. 2) fasciculus Gracilis A. 3) fasciculus Cuneat B. 4) C

INTERNAL FEATURES OF BRAINSTEM

You should Know:

What is the level?
Identification for each section?
Internal structure?

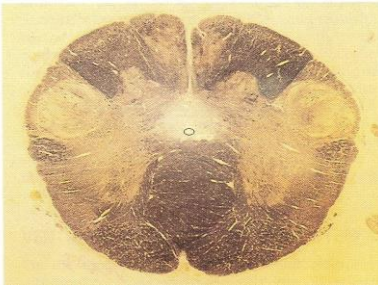
-Usually U won't be asked to identify the cranial ns at the internal surface of BS.

ماراح نطلب منكم تحددون التراكيب الصغيرة -

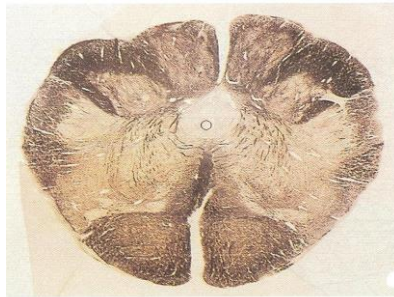
All sections are imp

Brain stem levels

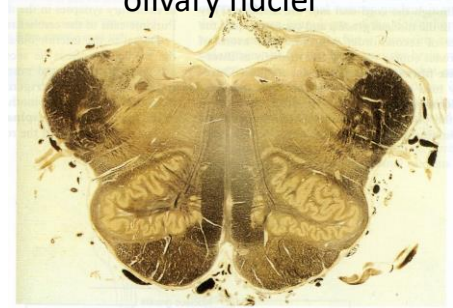
Caudal medulla:
Level of pyramidal decussation



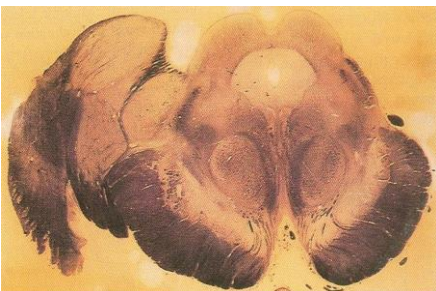
Mid medulla:
Level of sensory decussation



Rostral medulla:
level of inferior olivary nuclei



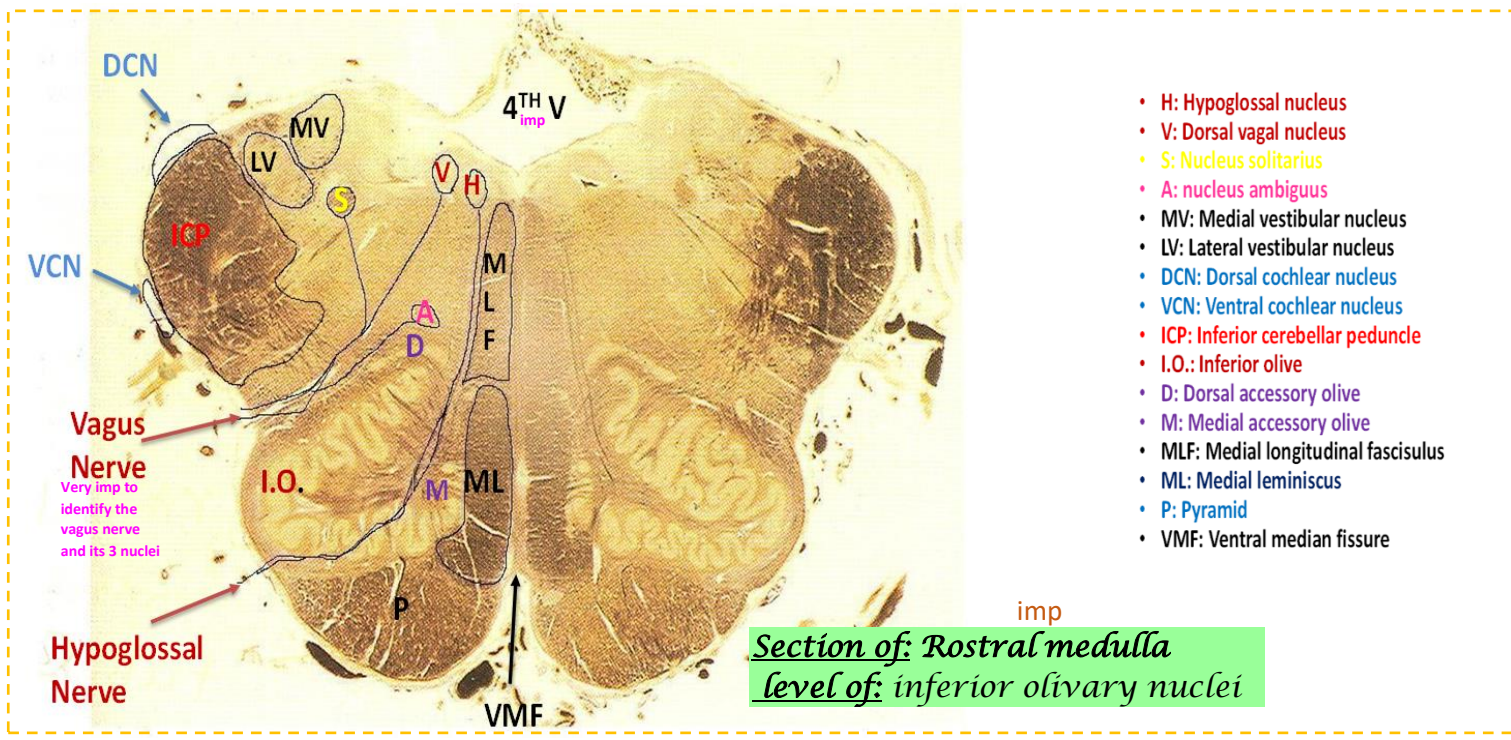
Midbrain:
Level of superior colliculus



Midbrain:
Level of inferior colliculus

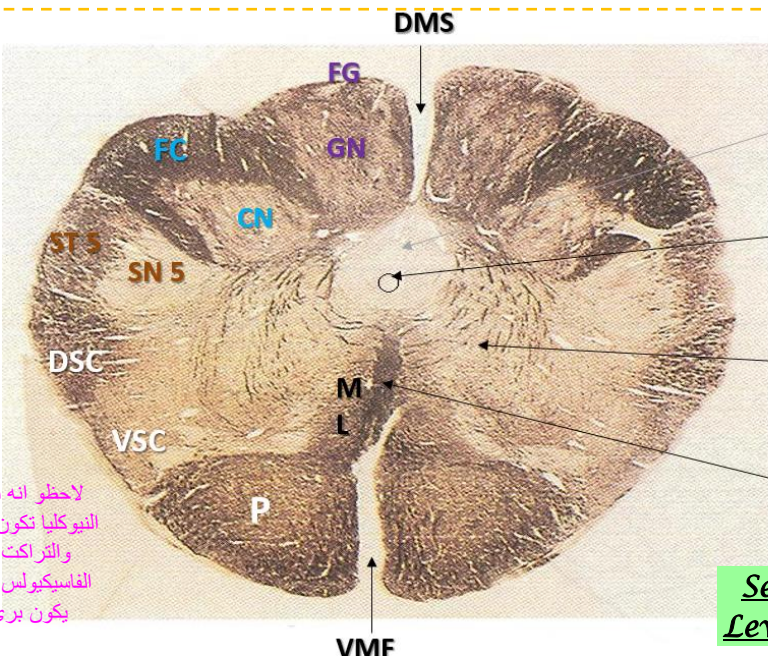


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- H: Hypoglossal nucleus
- V: Dorsal vagal nucleus
- S: Nucleus solitarius
- A: nucleus ambiguus
- MV: Medial vestibular nucleus
- LV: Lateral vestibular nucleus
- DCN: Dorsal cochlear nucleus
- VCN: Ventral cochlear nucleus
- ICP: Inferior cerebellar peduncle
- I.O.: Inferior olive
- D: Dorsal accessory olive
- M: Medial accessory olive
- MLF: Medial longitudinal fasciculus
- ML: Medial lemniscus
- P: Pyramid
- VMF: Ventral median fissure

Section of: Rostral medulla
level of: inferior olivary nuclei

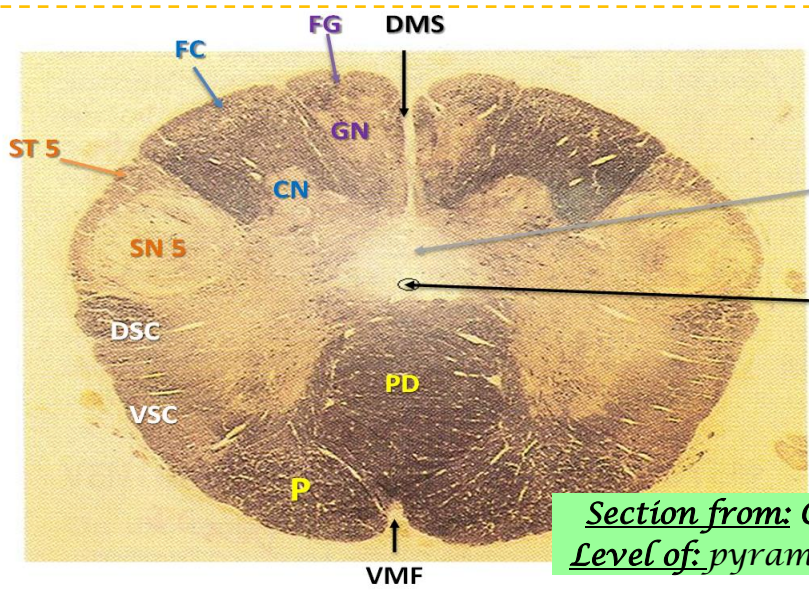


- Central grey matter
- Central canal
- Internal Arcuate Fibers
- Sensory Decussation

- DMS: Dorsal median sulcus
- FG: fasciculus gracilis
- GN: Gracile nucleus
- FC: Fasciculus cuneatus
- CN: Cuneate nucleus
- SN 5: Spinal nucleus of trigeminal nerve
- ST 5: Spinal tract of trigeminal nerve
- P: Pyramid
- ML: Medial lemniscus
- DSC: Dorsal spinocerebellar tract
- VSC: Ventral spinocerebellar tract
- VMF: Ventral median fissure

Section from: Mid medulla
Level of: sensory decussation

لاحظو انه دائما النيوكليا تكون داخل والتركت او الفاسكيولس تبعها يكون برى



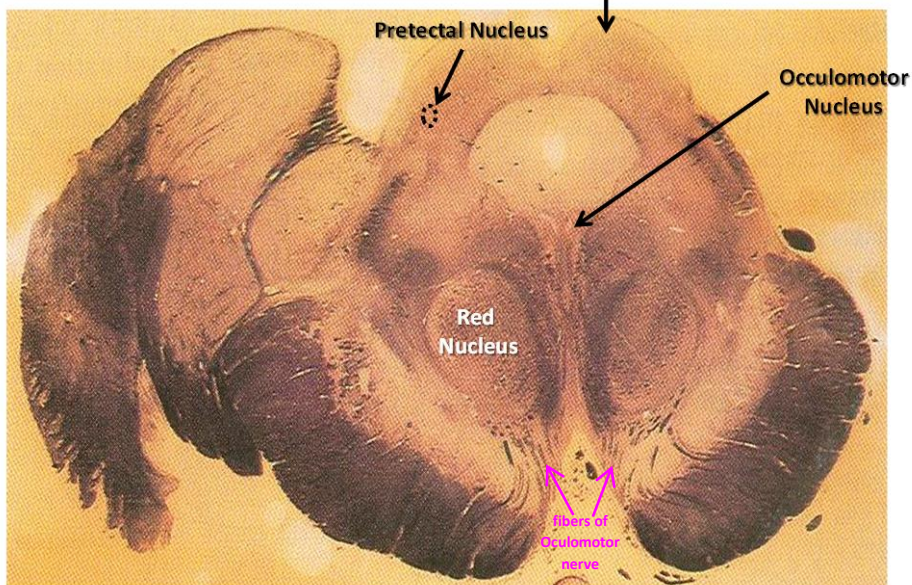
- Central grey matter
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- CN: Cuneate nucleus
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- ST 5: Spinal tract of trigeminal nerve
- P: Pyramid
- PD: Pyramidal decussation
- DSC: Dorsal spinocerebellar tract
- VSC: Ventral spinocerebellar tract
- VMF: Ventral median fissure

Section from: Caudal medulla
Level of: pyramidal decussation

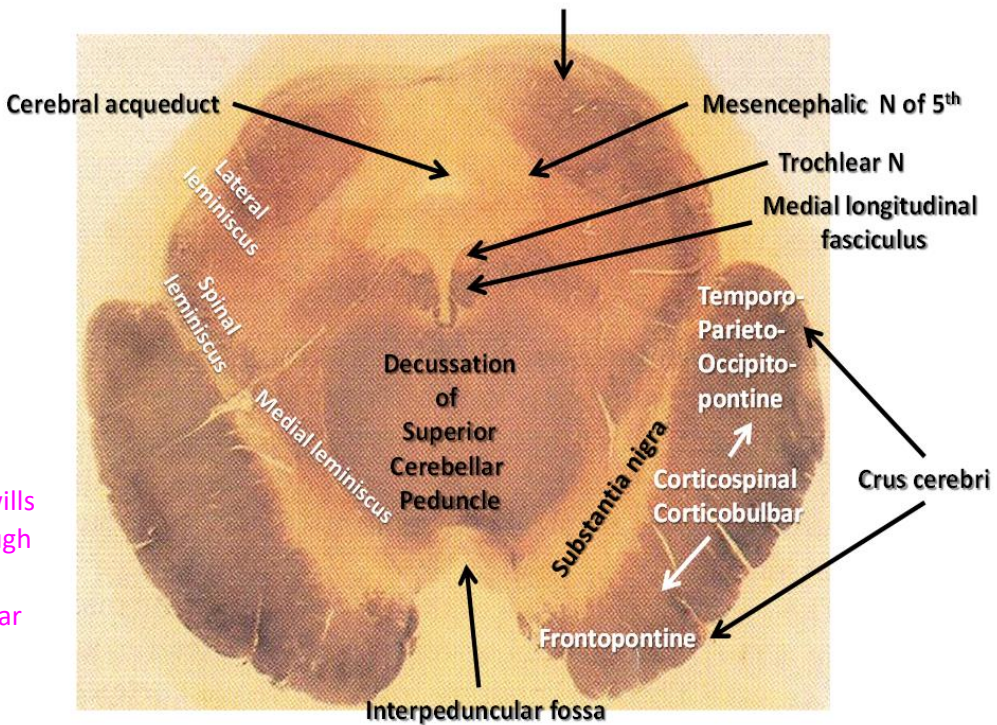
No lateral lemniscus

SUPERIOR COLLICULUS



*Section from: Midbrain
Level of: superior Colliculi*

INFERIOR COLLICULUS

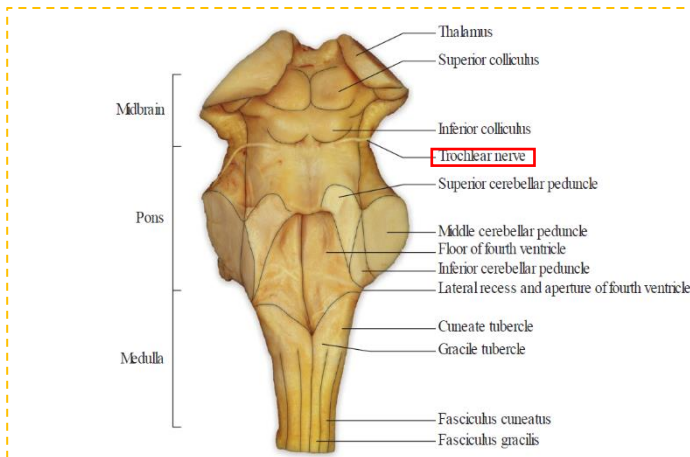


Circus of wills pass through interpeduncular fossa

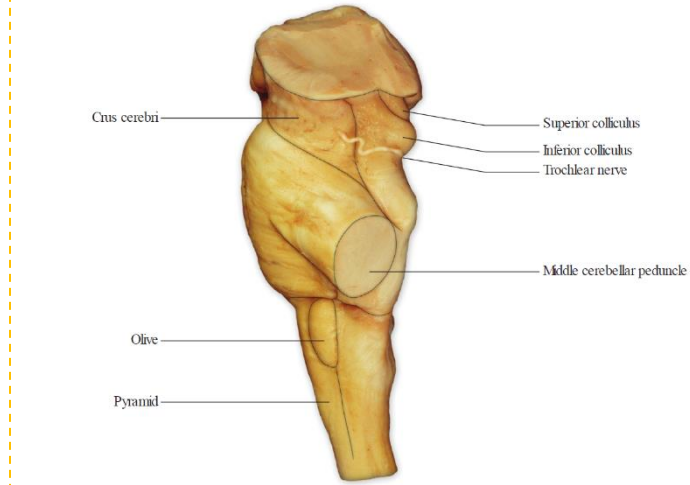
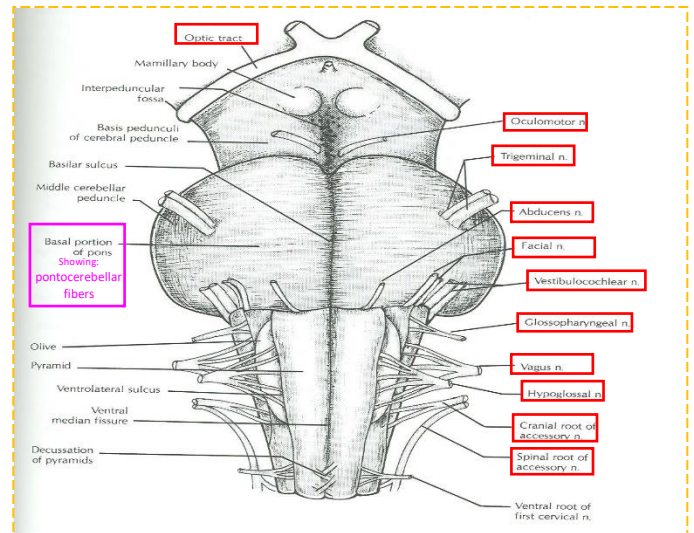
*Section from: Midbrain
Level of: Inferior Colliculi*

EXTERNAL FEATURES OF BRAINSTEM & CRANIAL NERVES

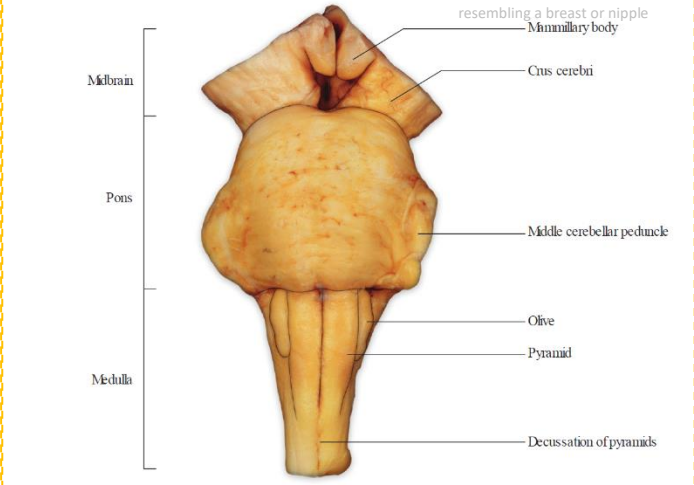
U will be asked to identify the cranial nerves at the external surface of BS



Dorsal aspect of the brainstem.



Lateral aspect of the brainstem.



Ventral aspect of the brainstem.

YOU SHOULD KNOW:

Dr. abulmakarem said:

#What are the nerves making contributions to the pharyngeal plexus?

Vagues(motor)

+9th (sensory supplies the mucus mb)

+cranial accessory (motor)

- Name of cranial nerves
- Motor & sensory supply
- Effect of injury

Cranial nerves supply the eye imp

Effect of injuries are very imp

#Spinal root of accessory n: arises from C1-C5
Supplies the sternomastoid and trapezius ,
Dropping of the shoulder is an obvious sign of injury of the nerve.

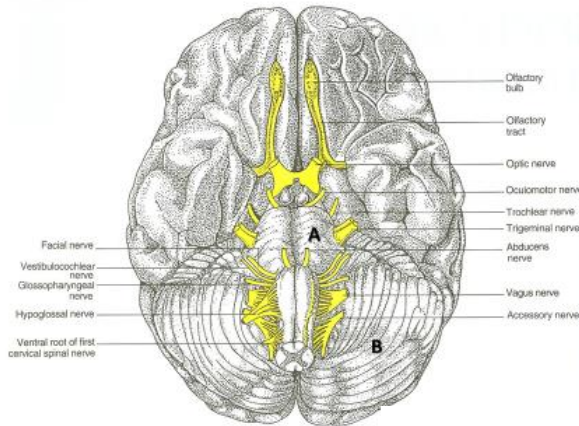
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Cranial nerve	Component Fibers	Structures innervated	injury
I Olfactory	Sensory	Olfactory epithelium	Anosmia loss of smell sensation Due to damage to olfactory epithelium
II Optic	Sensory	Retina	Lesion results in: visual field defects and loss of visual acuity, a defect of vision is called anopsia -A lesion of the right optic nerve-> loss of vision in the right eye - A lesion of the optic chiasm -> bitemporal hemianopsia. -A lesion of the right optic tract & right optic radiation-> contralateral homonymous hemianopsia. -A lesion of both visual cortices -> complete blindness.
III Oculomotor	Motor	Superior, inferior and medial rectus muscles; inferior oblique muscle; levator palpebrae superioris muscle	Lateral squint -Ptosis-Diplopia-Impaired downward & inward movement of the eye ball on the damaged side)
	Parasympathetic	Sphincter pupillae and ciliary muscle of the eyeball	Pupillary dilatation-Loss of accommodation
IV Trochlear	Motor	Superior oblique muscle	-diplopia -Inability to rotate the eye inferolaterally.
V Trigeminal	Sensory	Face, scalp, cornea, nasal and oral cavities, cranial dura mater	trigeminal neuralgia or tic douloureux
	Motor	Muscles of mastication; tensor tympani	
VI Abducens	Motor	Lateral rectus muscle	Inability to direct the affected eye laterally (medial squint).
VII Facial	Sensory	Anterior two-thirds of tongue	Bell's Palsy
	Motor	Muscles of facial expression; stapedius muscle	
	Parasympathetic	Salivary and lacrimal glands,	
VIII Vestibulocochlear	Sensory	Vestibular apparatus; cochlea	deafness ,tinnitus ,vertigo, dizziness, nausea, nystagmus, loss of balance and ataxia .
IX Glossopharyngeal	Sensory	Pharynx, posterior third of tongue, Eustachian tube, middle ear, Posterior third of tongue; carotid body,carotid sinus.	dysphonia, dysphagia عسر البلع and absence of the gag reflex.
	Motor	Stylopharyngeus muscle	
	Parasympathetic	Parotid salivary gland	
X Vagus	Sensory	Pharynx, larynx, trachea, oesophagus, external Ear, Thoracic and abdominal viscera; aortic bodies, aortic arch.	causes hoarseness or loss of voice, impaired swallowing, GI dysfunction, blood pressure anomalies
	Motor	Soft palate, pharynx, larynx, upper oesophagus	
	Parasympathetic	Thoracic and abdominal viscera	
XI Accessory	Motor	Sternomastoid and trapezius muscles, soft palate, larynx, pharynx	-Difficulty in swallowing and speech. -Inability to turn the head. -Inability to shrug (raise) the shoulder. -Winging of scapula.
XII Hypoglossal	Motor	Intrinsic and extrinsic muscles of tongue	-Loss of tongue movements -Difficulty in chewing and speech -The tongue paralyses

Test Yourself. About Brainstem & CNs

Q1:

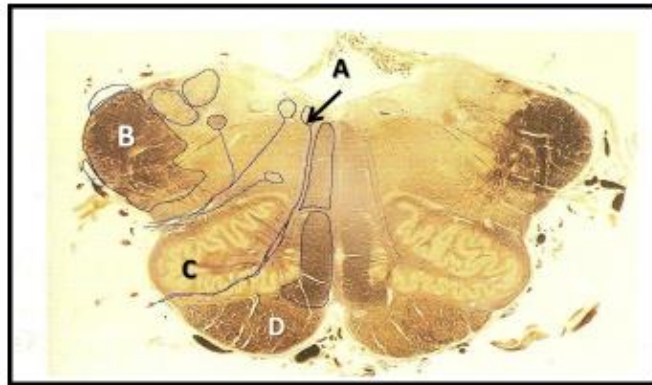
Clinical examination of a patient revealed a loss of taste sensation of posterior 1/3 of tongue



1. Identify A:
2. Identify B:
3. What is the name of the nerve affected?

Q2:

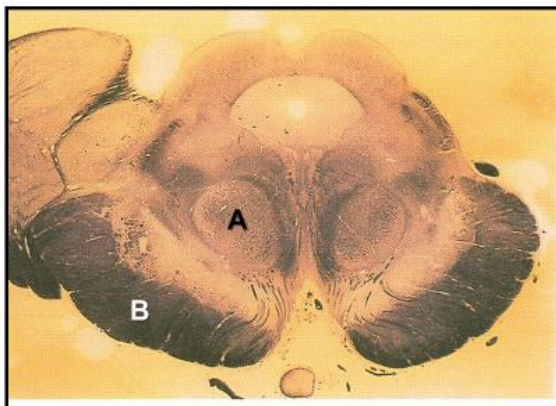
Examination of a patient revealed motor weakness, increased tone & exaggerated reflexes of his left upper & lower limbs



1. Identify A:
2. Identify B:
3. Identify C:
4. Identify D:
5. Which one of these parts is affected in the case above?
6. Mention the artery supplying D.
7. Mention the most important connection to C.
8. What the nucleus supplies A?

Q3:

- 1) Identify the section & its level.
- 2) Mention one connection to A.
- 3) Mention the name of one type of fibers passing in B.



ANSWERS

AQ1: 1) Pons. 2) Cerebellum
.3) Glossopharyngeal

AQ2: 1) Hypoglossal nucleus. 2) Inferior cerebellar peduncle. 3) Inferior olivary nucleus. 4) Pyramid (corticospinal tract). 5) Pyramid D.

6) Vertebral artery.

7) Cerebellum. 8) All muscles of tongue except palatoglossus

AQ3: 1) Midbrain, level of superior colliculus. 2) Spinal cord, thalamus.

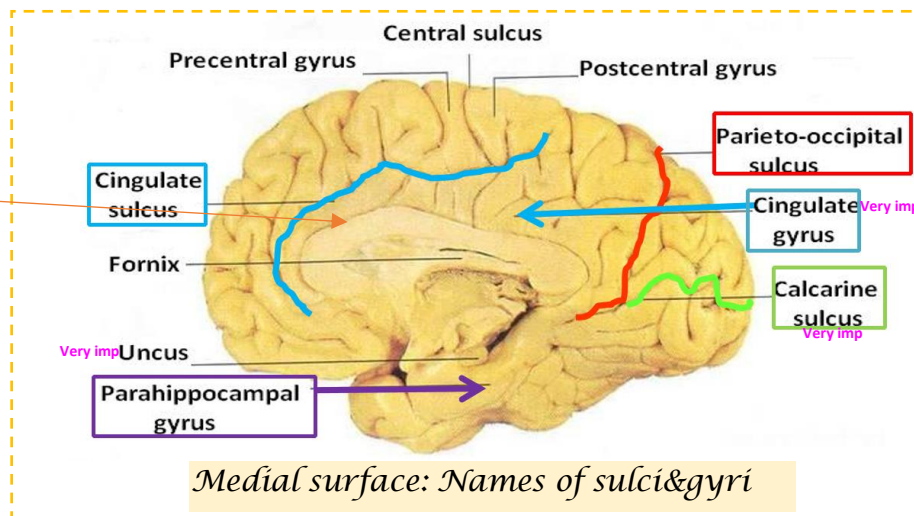
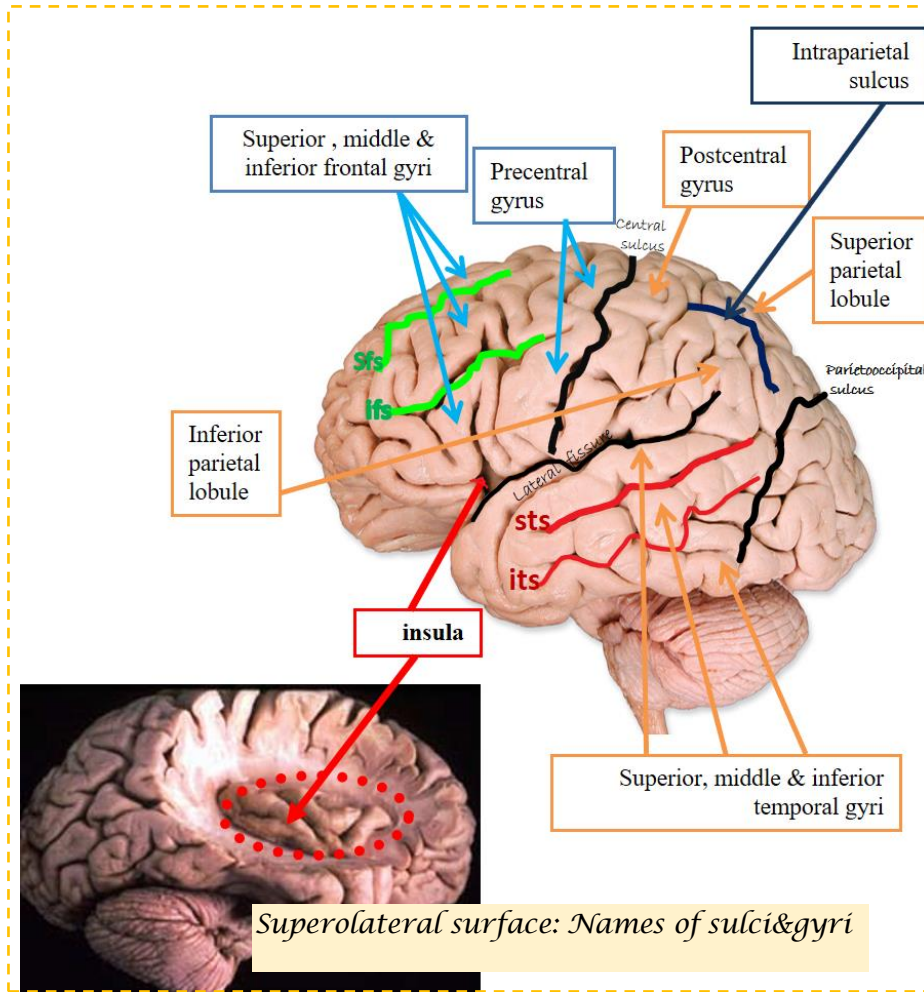
3) Corticospinal,

CEREBRUM

YOU SHOULD KNOW:

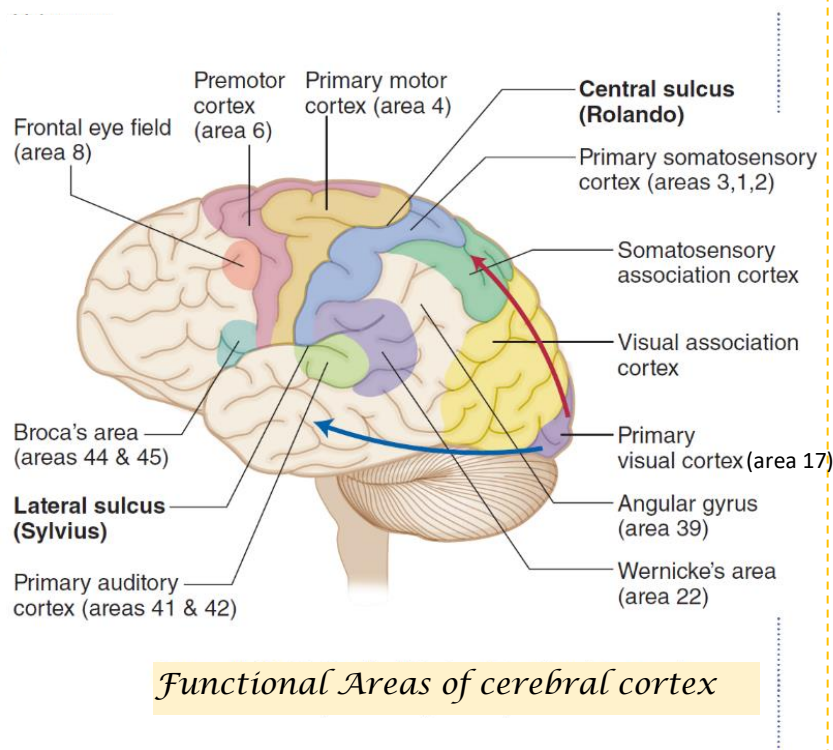
مهمه دائما تجي بكل اختيار

Name of gyri, sulci, important functional areas, arterial supply



Medial cerebral surface --> sulci R imp gyri R not

(Para hippocampal,...)



Functional Areas of cerebral cortex

Visual association cortex is obvious in the medial surface

You are required to Memorize the number of each functional area

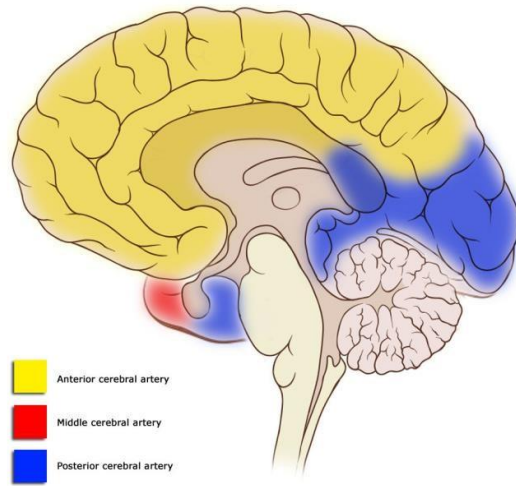
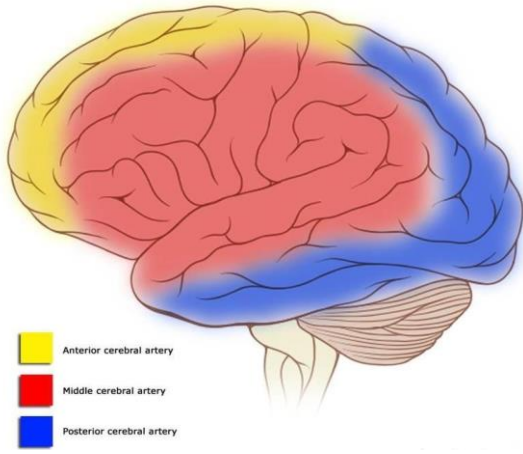


U won't be asked about the number of each functional area in OSPE

Superolateral surface

Blood supply very imp

medial surface



مره يجيون يسألون عن الليجنز يقولك اذا انقطع الشريان الفلاني هذا الشخص وش بيفقد او شخص يشتكي من شي وش الشريان الي متضرر

E.g.: man complains of weakness in his left leg. which artery is affected?
Right ACA

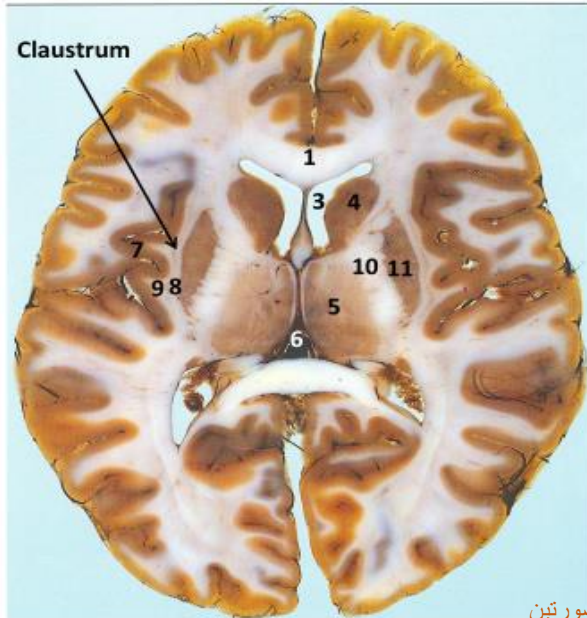
Why? As u know lower limbs & perineum represent in the medial surface of cerebrum while upper limbs & face represent in the lateral surface

(regarding to homunculus map)

Anterior cerebral artery	Supplies: orbital and medial surfaces of the frontal and parietal lobes A narrow part on the superolateral surface
Middle cerebral artery	Supplies entire Superolateral surface: <ul style="list-style-type: none"> Somatosensory Cortex Motor Cortex Language areas: Broca's Area, Wernicke's Area Auditory areas: Primary auditory area, Auditory association (Heschl's Gyrus)
Posterior cerebral artery <i>Continuation of vertebral artery</i>	Supplies: Anterior and inferior parts of temporal lobe, Uncus, Inferior temporal gyrus, Inferior and Medial parts of Occipital lobe (visual areas)

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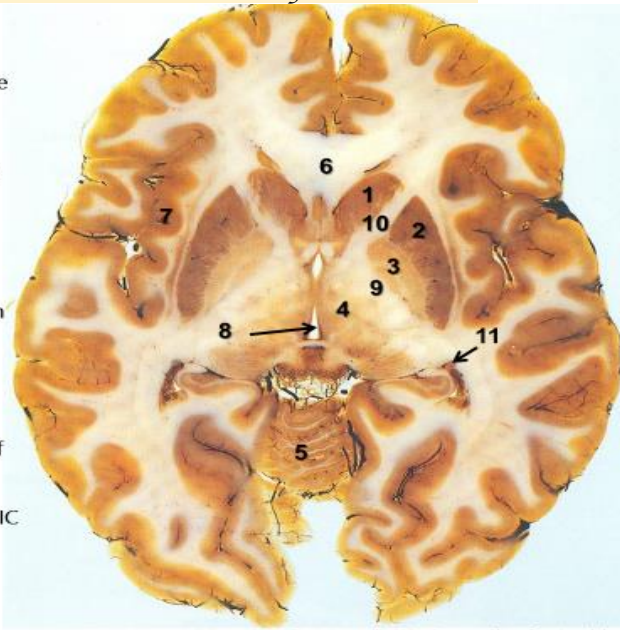
- 1- Corpus callosum
- 3- Lateral ventricle
- 4- Caudate nucleus
- 5- Thalamus
- 6- Third ventricle
- 7- Insula
- 8- External capsule
- 9- Extreme capsule
- 10- Internal capsule
- 11- Lentiform nucleus



يمكن تجميع وحده من هالصورتين

Transverse sections of cerebrum

- 1) Head of Caudate
- 2) Putamen
- 3) Globus pallidus
- 4) Thalamus
- 5) Cerebellum
- 6) Corpus callosum
- 7) Insula
- 8) Third ventricle
- 9) Posterior limb of IC
- 10) Anterior limb of IC
- 11) Tail of Caudate



septum pellucidum
زي الحاجز يفصل بين

2 lateral ventricles
هذا الحاجز سقفه

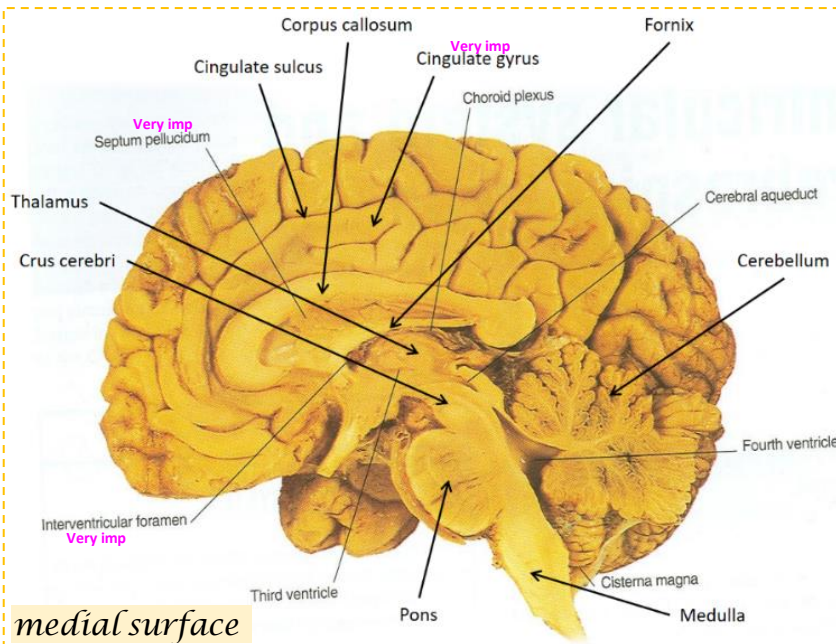
Corpus callosum
وأرضيته

Fornix

تحت الارضيه في شقتين
الي هي (2 thalami)

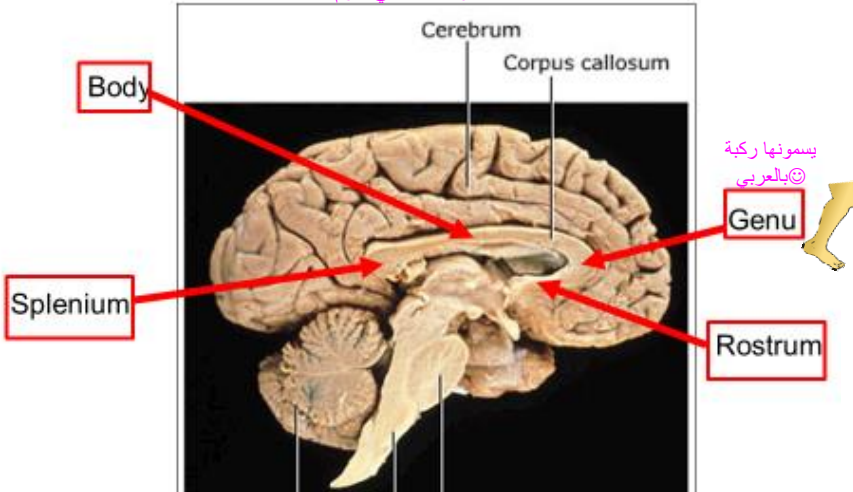
الي بين الشقتين

3rd ventricle



Parts of Corpus callosum

مهمه جدا
هذي الجزئية د. شيماء قالتلي انها جدا
مهمه واكدت علي لازم احطها

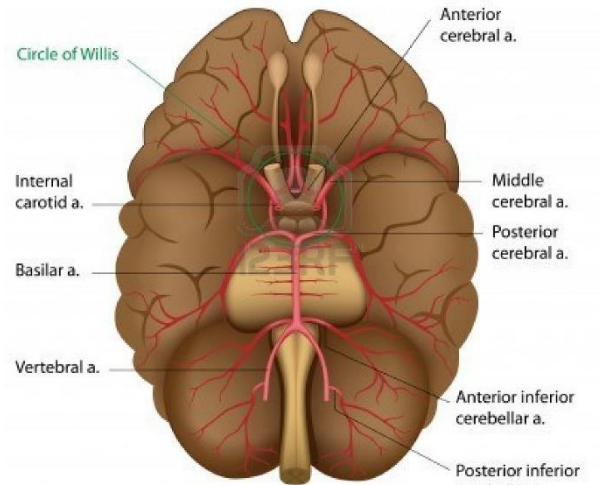


Corpus callosum considers as **Commissural fiber**

Extra pic

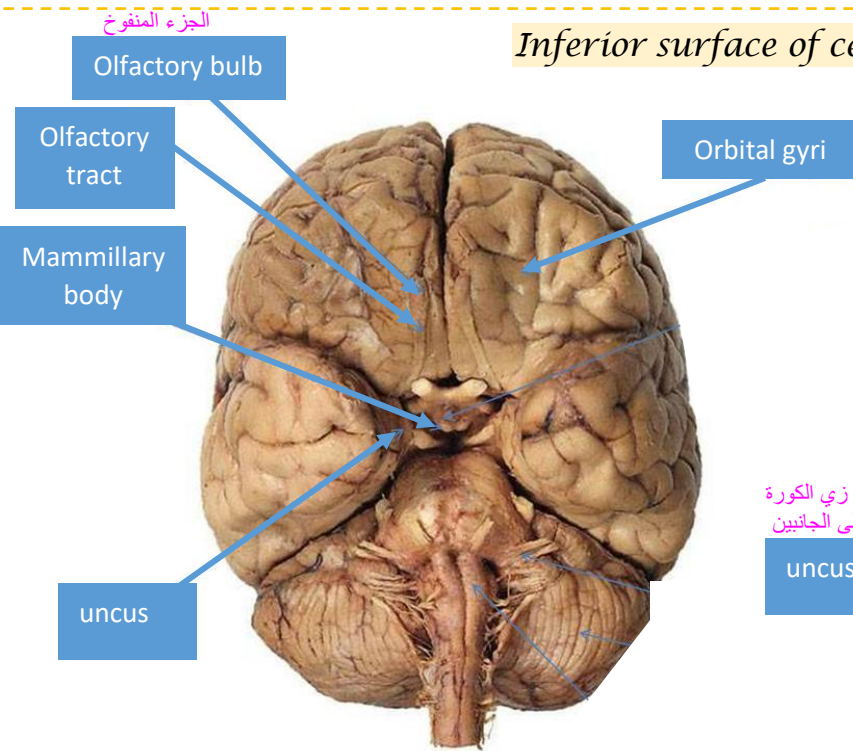
مب مره مهمه بس اقرأوها سريع

Blood supply of the brain



Circle of wills **Composed of:** 2 Anterior cerebral arteries + 2 Internal carotid arteries + 2 Posterior cerebral arteries + 2 Posterior communicating arteries + 1 Anterior communicating artery

Inferior surface of cerebrum

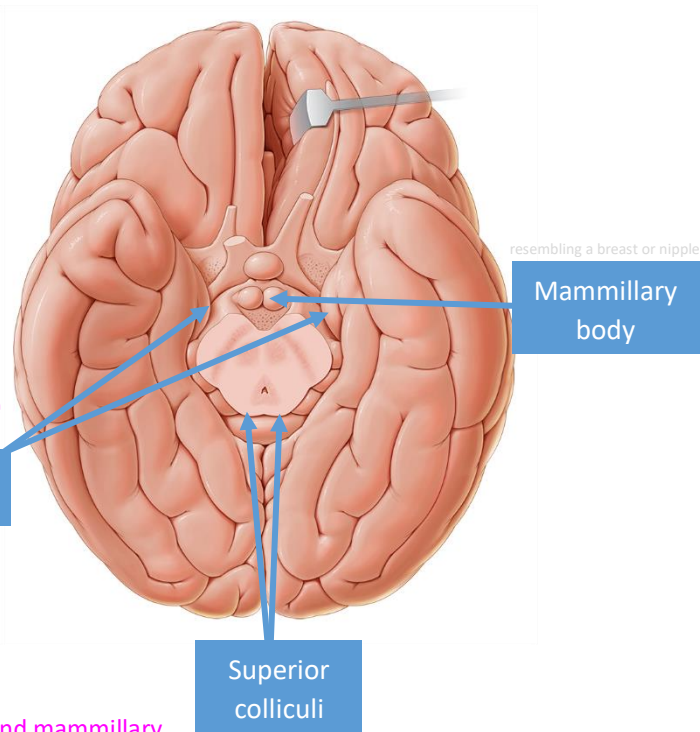


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You should be able to differentiate between superior colliculi and mammillary body at the inferior surface of the cerebrum...

في سنه من السنوات جاهم سؤال صورة للانفيريرور سيربروم وكان حاط سهم على السوبريرور كوليكولاي بس اغلب الطلاب ماعرفو يميزون وكتبو

⊗ Mammillary body

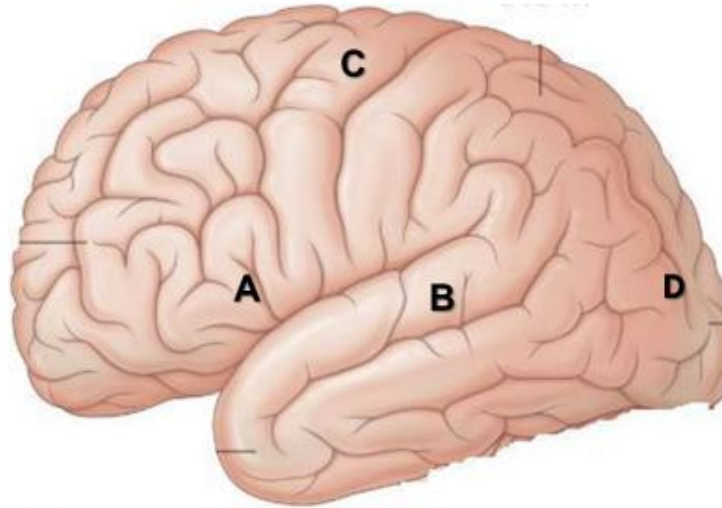


Test Yourself About Cerebrum

Q1:

CLINICAL CASE

A 65-year-old man was admitted to the ICU for head injury following a car accident. On examination he suffered from **Contralateral homonymous hemianopsia**



- 1) What is the name of the lobe affected?
- 2) What is the letter corresponding to the lobe affected in the figure?
- 3) What is the name of the artery supplying the lobe affected?
- 4) Mention the function of A.
- 5) Mention the arterial supply of B.
- 6) Mention the name of gyrus C.

Q2:

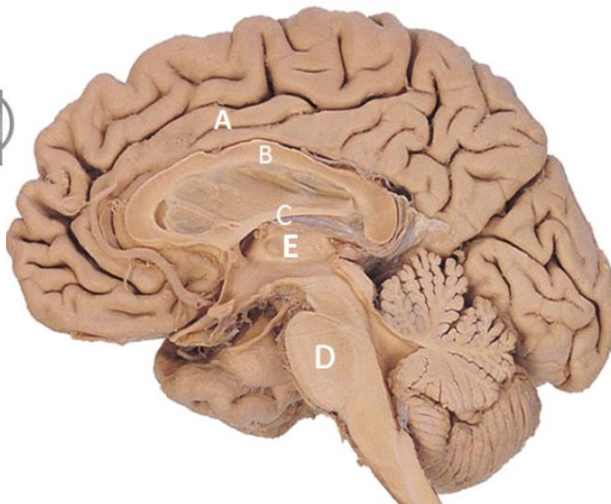
CLINICAL CASES

man came to the hospital with weakness in the right side of the body and inability to speak

- 1) what are the areas that affected and the name of gyri?
- 2) and its blood supply?

Q3:

CLINICAL CASES



- 1) WHAT is the arterial supply in A?
- 2) What is the type of the fibers in B?
- 3) Identify C?
- 4) Identify E?
- 5) Identify D?



ANSWERS

AQ1: 1-Occipital. 2-d. 3- Posterior cerebral. 4-motor speech area. 5-Middle cerebral artery. 6-Precentral gyrus.

AQ2: 1-areas : (Broca's area , inferior frontal gyrus) &(primary motor area, precentral gyrus) .

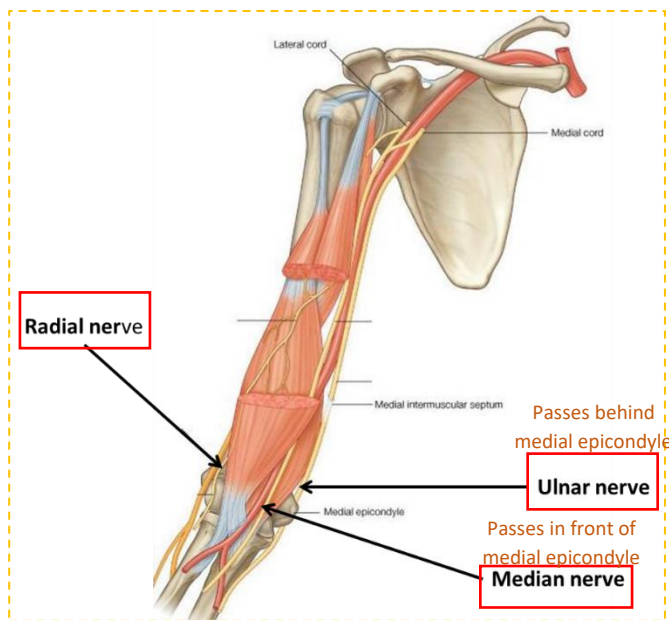
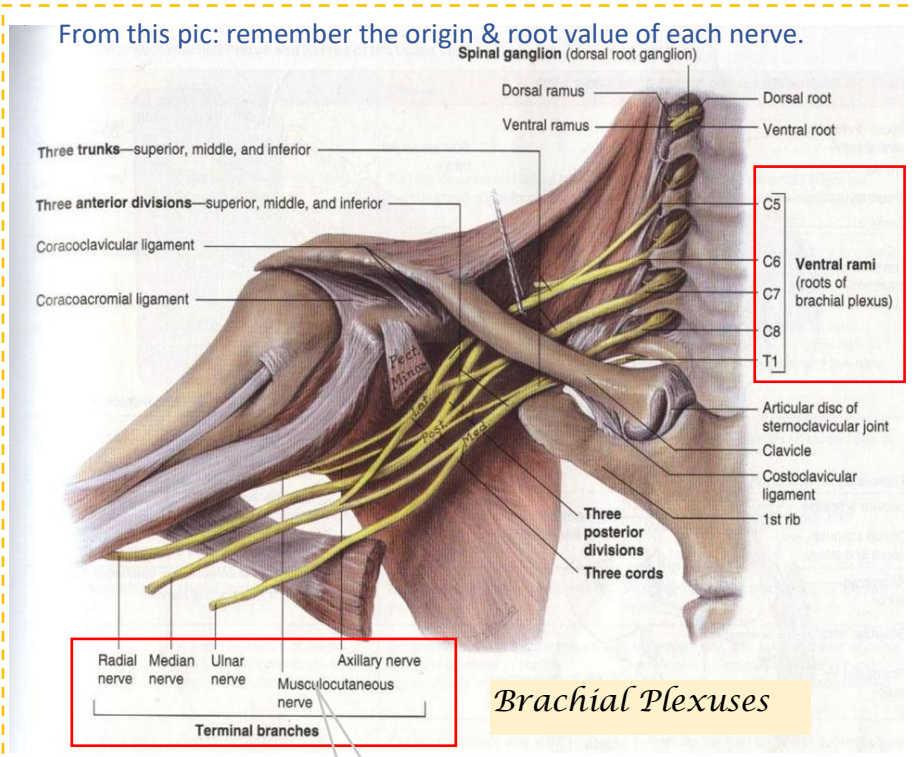
2- Blood supply : middle cerebral artery .

AQ3: 1-Anterior cerebral artery. 2-Corpus callosum (Commissural fibers). 3-fornix. 4-thalamus. 5-pons

PERIPHERAL NERVES

YOU SHOULD KNOW: (Ulnar, median, radial, sciatic, common peroneal & tibial)

- Root values of each nerve
- Name of plexus from which arise
- Name of cords from which arise
- Name of muscles or groups of muscles supplied by nerve and their main action
- Areas of skin supplied by the nerve
- Name of lesion or deformity caused by nerve injury



musculocutaneous nerve arises from the **lateral cord** of the brachial plexus, and contains fibers from spinal roots **C5, C6 and C7**





This table has been added by dr. shimaa

#What are the causes of radial nerve injury?






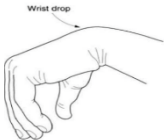
fracture or dislocation of the head of the humerus OR due to compression of the lower part of the brachial plexus (Saturday night syndrome)

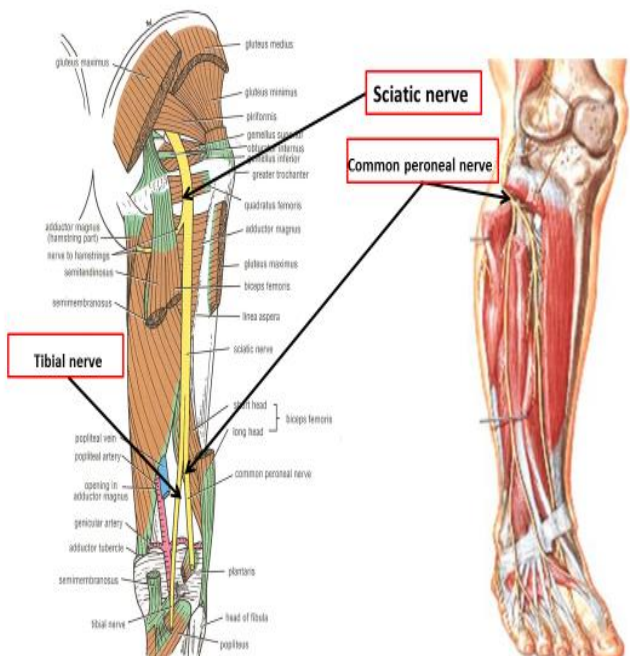
#He mentioned the muscles a lot especially of shoulder and the effect of Long thoracic nerve lesion. But at the end he said muscles R not imp we're not studying MSK we care about nerves

only 😞 !

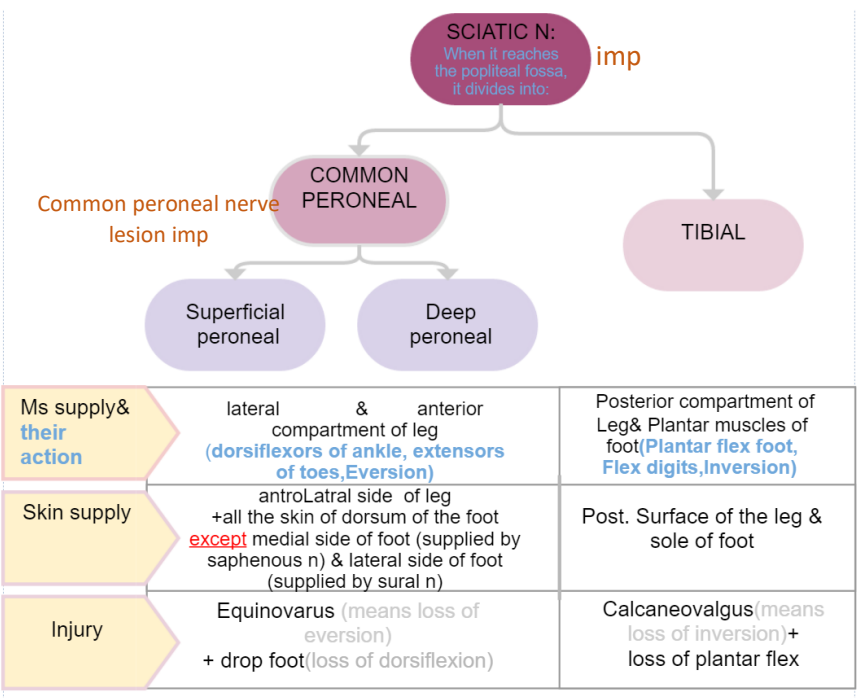
deformity	cause	Descriptions
Erb-Duchenne Palsy 	Upper Trunk C5,6 lesion of brachial plexus	The arm hangs by the side and is rotated medially. The forearm is extended and pronated. 
Klumpke Palsy	Lower Trunk (C8,T1) Lesion of brachial plexus	Partial Claw+ ape hand 
Winging of scapula	Long thoracic nerve injury	

➔ Continues on the next page

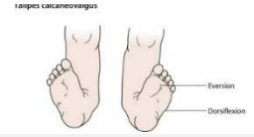
NERVE	ULNAR	MEDIAN	RADIAL	SCIATIC
PLEXUS	brachial	brachial	brachial	sacral
ROOT	C8 & T1	C5,6,7,8 & T1	C5, 6, 7, 8, & T1	L4,5&s1,2,3
CORD	Medial cord	from medial and lateral cords	posterior cord	_____
MUSCLES SUPPLIED & THEIR MAIN ACTION	Flexor carpi ulnaris +medial half of flexor digitorum profundus+ 3 hypothenar ms (a group of muscles associated with the little finger) + interossei + 3 rd & 4 th lumbricals (flexion wrist joint +flexion of 4 th and 5 th fingers+abd&add of all fingers)	All muscles in the anterior compartment of the forearm (except flexor carpi ulnaris and medial half of flexor digitorum profundus), three thenar muscles of the thumb + 1 st & 2 nd lumbricals. (flexion wrist joint +flexion of fingers)	Ms of post. Compartment of forearm+ triceps ms (extension of the wrist & fingers & elbow)	Innervates the muscles of the posterior thigh and the hamstring portion of the adductor magnus. Indirectly innervates (via its terminal branches) the muscles of the leg and foot. (Action: Flex knee & Extend thigh)
SKIN SUPPLIED	Medial 1 & 1/2 of palmar & dorsum of hand 	Skin over the palmar surface of the lateral three and half digits (up to nails beds) 	Skin over the dorsal surface of the lateral three and one-half digits 	No direct sensory functions. Indirectly innervates (via its terminal branches) All skin of foot & leg except medial side of leg and foot (saphenous nn)
NERVE INJURY	partial claw hand  د. ابوالمكارم ود. شيماء قالو انها جدا مهمه	- carpal tunnel syndrome - ape hand 	Drop hand. 	Its injury will affect the flexion of knee, extension of hip, all movements of leg & foot, as well as loss of sensation of skin of leg & foot (except areas supplied by saphenous branch of femoral nerve)



Regarding the pic above: remember the sciatic & its 2 terminal branches

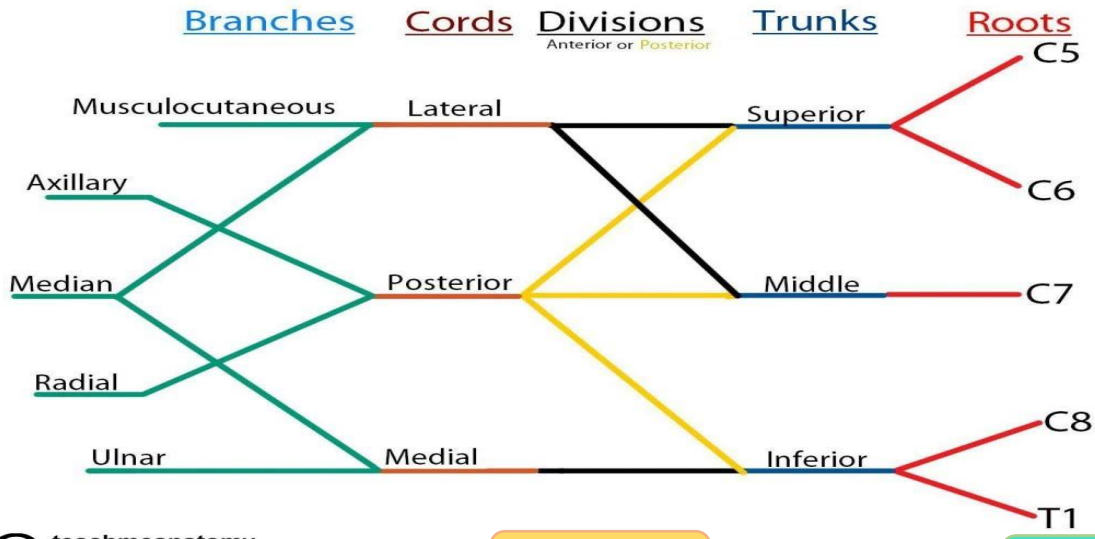


ممکن جیجیلکم زی ہال صورتین ویقولک ایش اسم الحاله و وش سببها

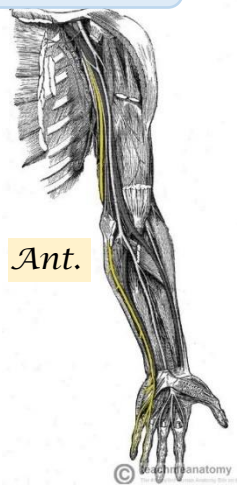


mnemonic: (TIBI)al nerve injury → (CAL)canoevalgus
→ call me
یعنی اذا تبي مني مني شي

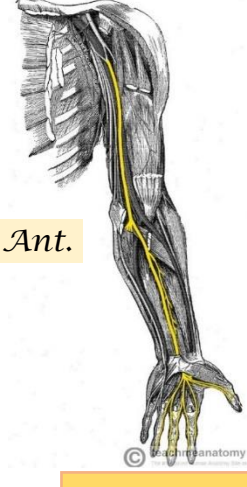
Extra page for better understanding



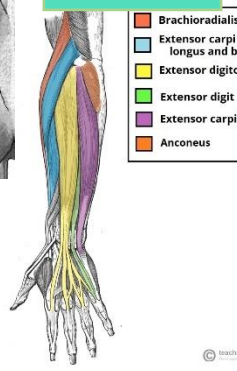
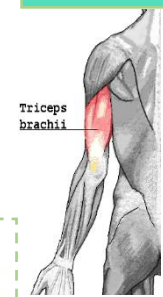
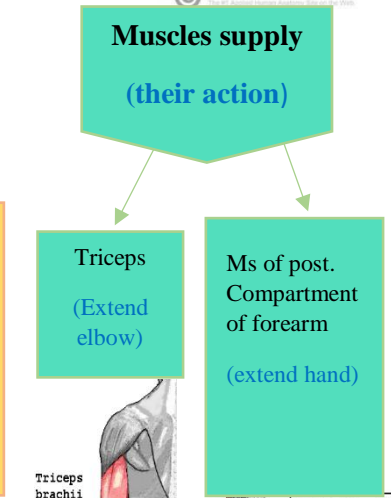
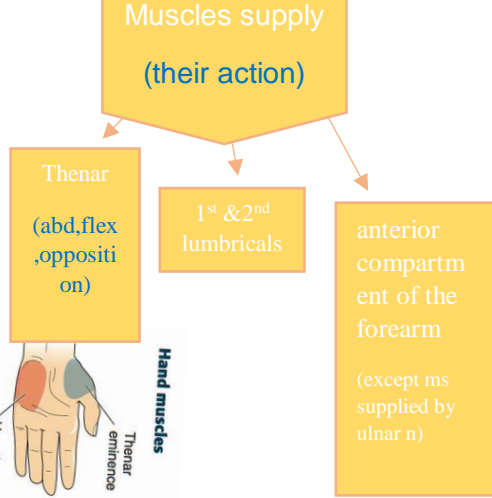
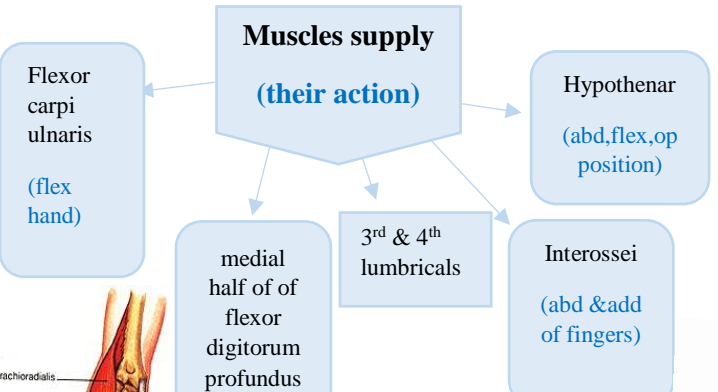
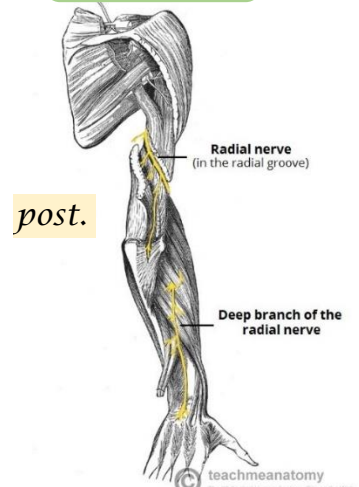
Ulnar n



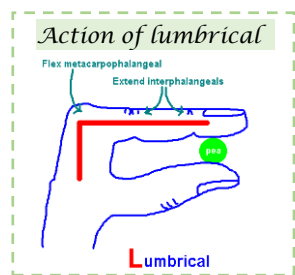
Median n



Radial n

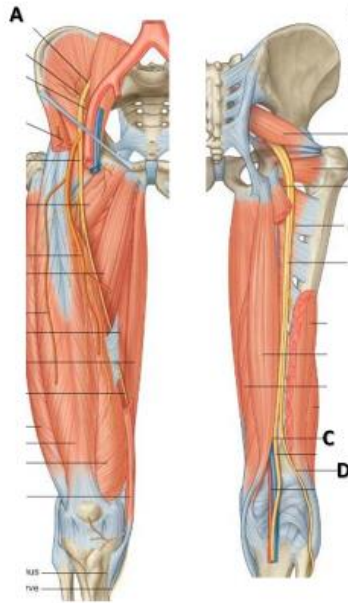


- Brachioradialis
- Extensor carpi radialis longus and brevis
- Extensor digitorum
- Extensor digiti minimi
- Extensor carpi ulnaris
- Anconeus



Test Yourself About PNS

Q1:



Clinical examination of a patient revealed
loss of extension of knee joint

1. Identify A:
2. Identify B:
3. Identify C:
4. Identify D:
5. Which one is responsible for the deformity above?
& What is the origin of this nerve?

Q2:



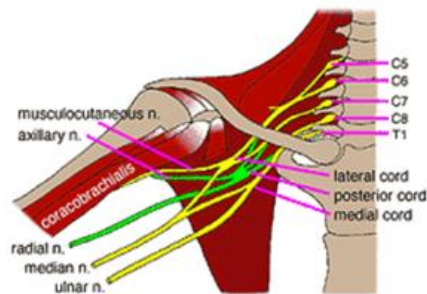
A patient presented with a wrist drop.

1. What is the name of the nerve affected?
2. What is the letter corresponding to the nerve affected?

Q3:



A 36-year-old man came to the hospital after a road side accident. The arm hangs by the side and is rotated medially; the forearm is extended and pronated.



1. Which roots of brachial plexus are involved?
2. What is the name given to this deformity?

Test Yourself. About PNS

Q4:

CLINICAL CASE

Refer to the diagrams. The diagrams on the right show an area of anesthesia occurring after a cut in the lower left figure. Nerve regeneration over a period of weeks indicates a reduced area of anesthesia as shown. Assume only nerves are cut and not any tendons.



- 1-The injured nerve is the:
- 2-What is the origin of this nerve?!

Q5:

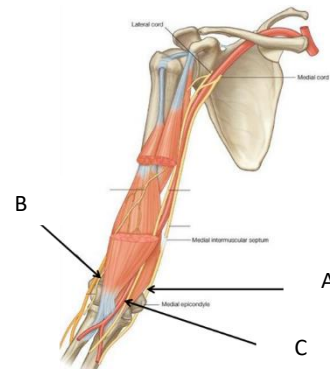
CLINICAL CASE

Patient comes to the doctor complaining of tingling or numbness of the lateral part of his right palm with atrophy of the thenar muscles. Pressing the flexor retinaculum producing the same symptoms.

- 1)Which nerve is mostly affected?
- 2)What's the problem of the patient?
- 3)Identify the label nerves?

A:

B:

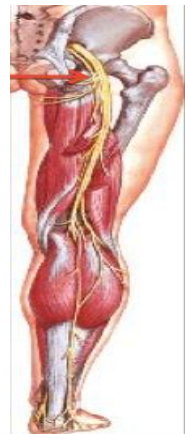


Q6:

CLINICAL CASE

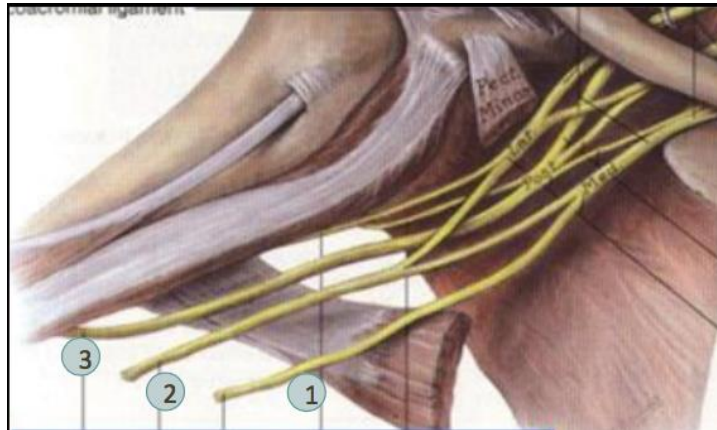
Boy went to the hospital for injection , and there was misplaced intramuscular injection in his buttock

- 1)Identify the nerve in the image(arrow)?
- 2)What's the root value of this nerve?
- 3)Mention two terminal branches of this nerve?
- 4)What's the characteristic gait of this nerve lesion?



Test Yourself. About PNS

Q7:



- 1) From which cord the nerve (2) arise?
- 2) Name 2 muscles supplied by the nerve (1)
- 3) What will happen as a result of injury to the nerve (3) ?
- 4) What is the root value of (3) ?

Q8:



- 1) Patient has fracture on FIBULA bone Which nerve will be affected?
- 2) plantar flexion of the ankle joint, inversion and Flexors of toes) This condition called?

Q9:



- 1) patient lost the posterior compartment of leg & intrinsic muscles of sole so (Dorsi flexors of ankle, Extensors of toes, Evertors of foot), which nerve is responsible?
- 2) we called this condition?

ANSWERS

AQ1: 1) A: Femoral. 2) B: Sciatic. 3) C: Tibial. 4) D: Common peroneal.

5) A (femoral) & from lumbar plexus (L2,3,4)

AQ2: 1) Radial. 2) B.

AQ3: 1) C5 – C6. 2) Erb-Duchenne (Waiter's tip) deformity

AQ4: 1) ULNAR. 2) brachial PLEXUS, ROOT C 8 & T1, Medial cord

AQ5: 1) Median nerve 2) "CARPAL TUNNEL" syndrome .

3) A=ulnar, B=radial

AQ6: 1) Sciatic nerve

2) L4,5 S1,2,3 (sacral plexus)

3) common peroneal (fibular) & Tibial

4) High-stepping walk (called Steppage gait or Foot drop Gait)

AQ7: 1) Median nerve arise from lateral & medial cord

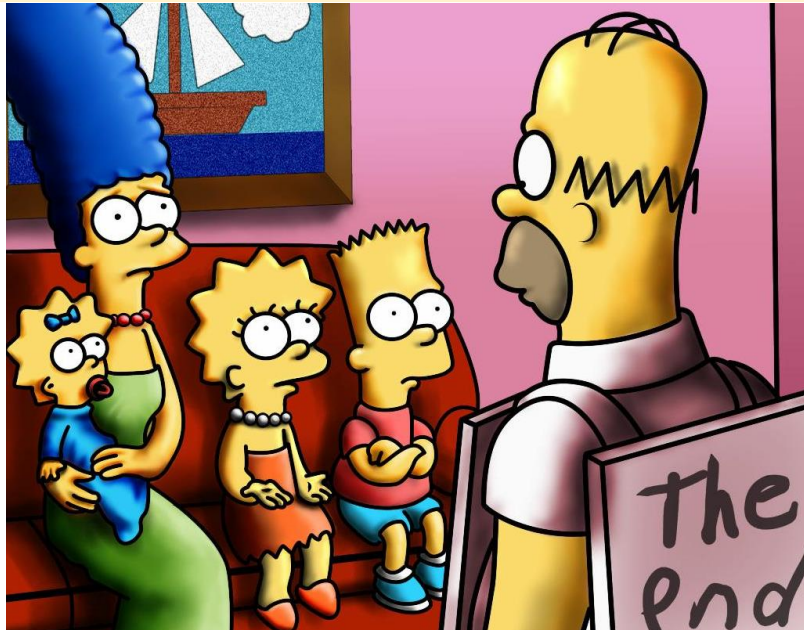
2) Ulnar nerve : Flexor carpi ulnaris-Three hypothenar muscles - Adductor pollicis .

3) Radial nerve > Wrist drop

4) C5,6,7,8,T1 (brachial plexus)

AQ8: 1) common peroneal nerve. 2) Equinovarus

AQ9: 1) Tibial. 2) Calcaneovalgus



انتهى: نتمنى أن وفقنا في تسهيل المذاكرة عليكم ونعتذر عن اي تقصير