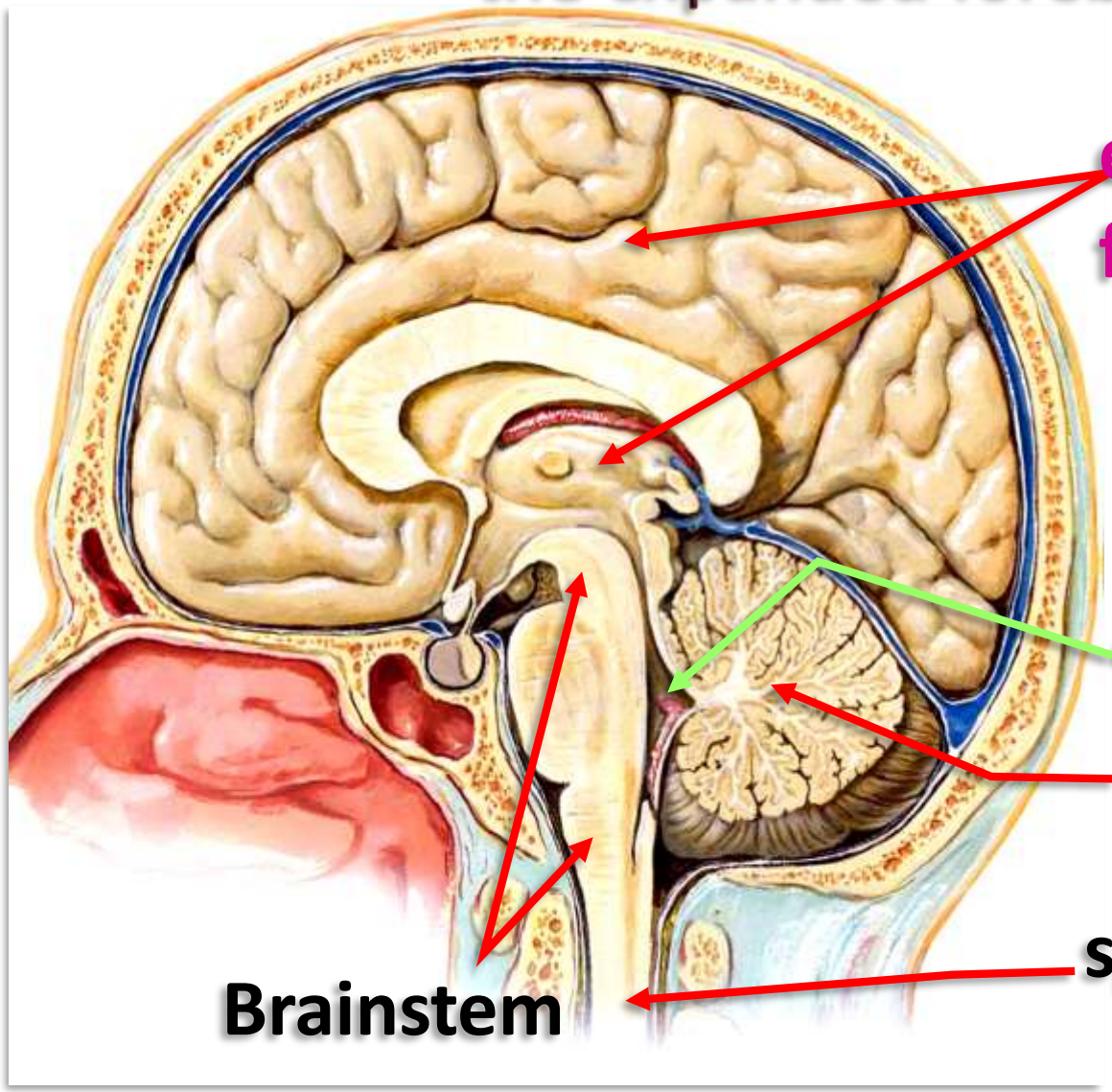
أهلا وسهلا

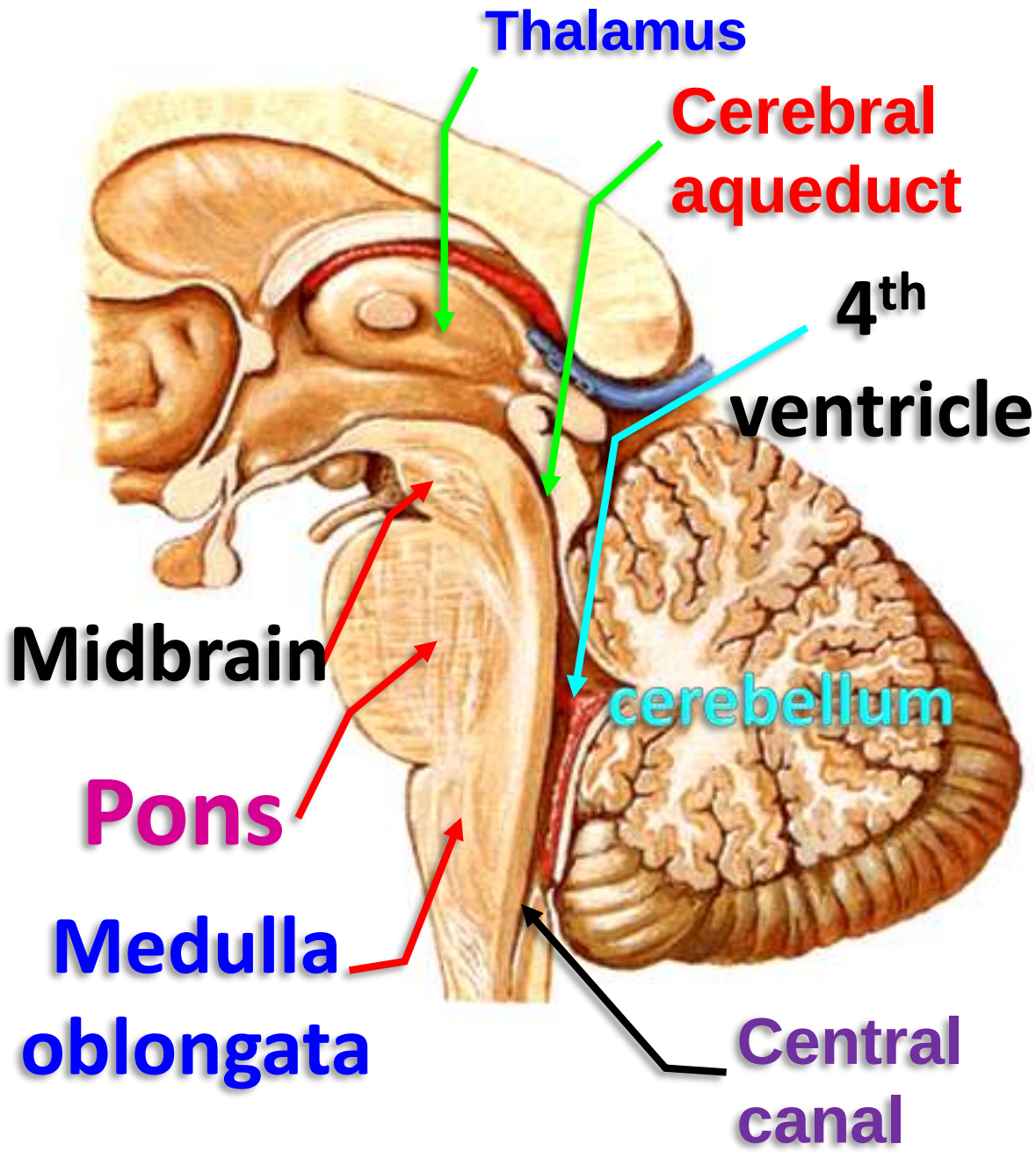
الأستاذ الدكتور/ يوسف حسين

أستاذ التشريح وعلم الأجنة

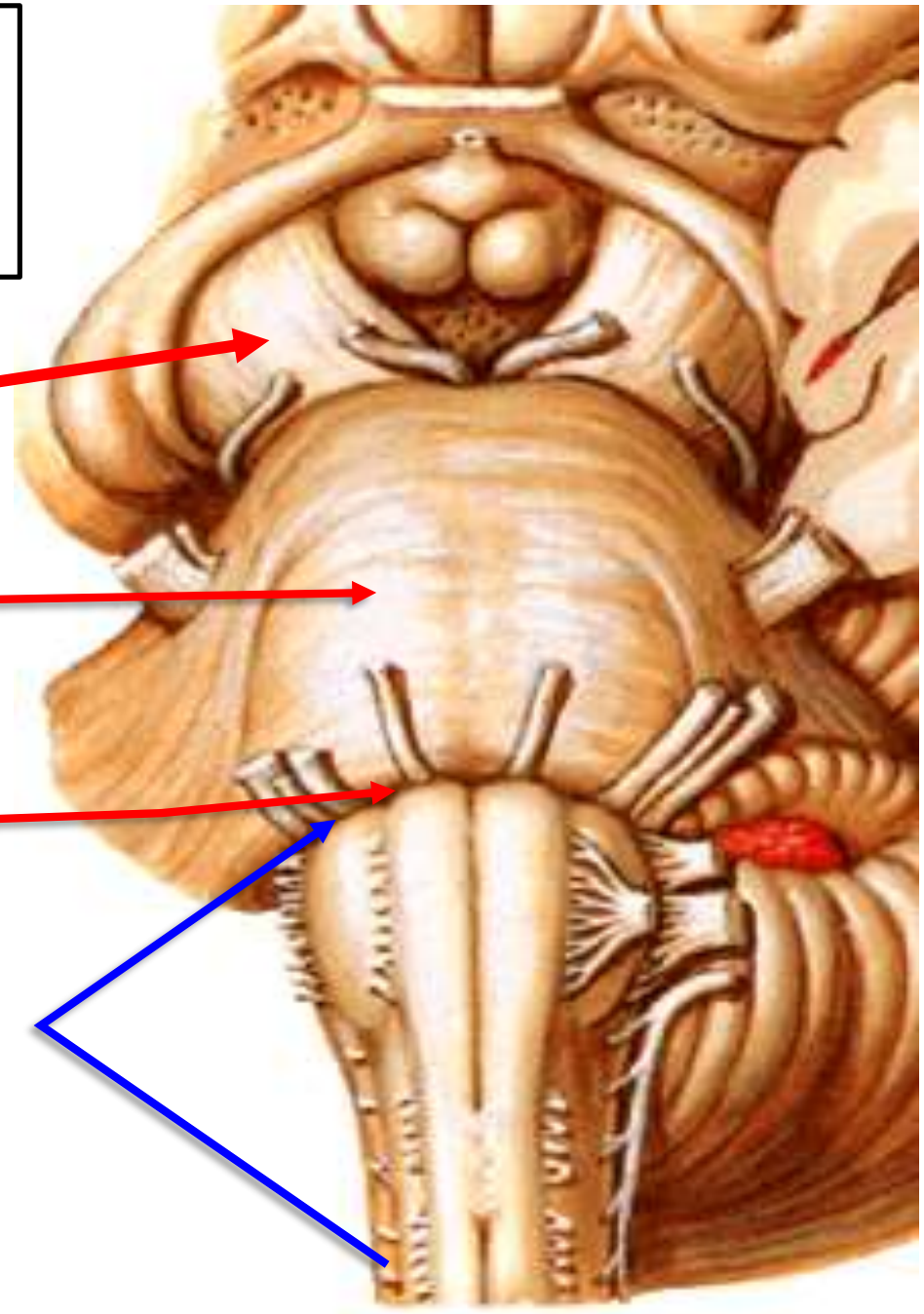
سلايدات اللاب ٨٨

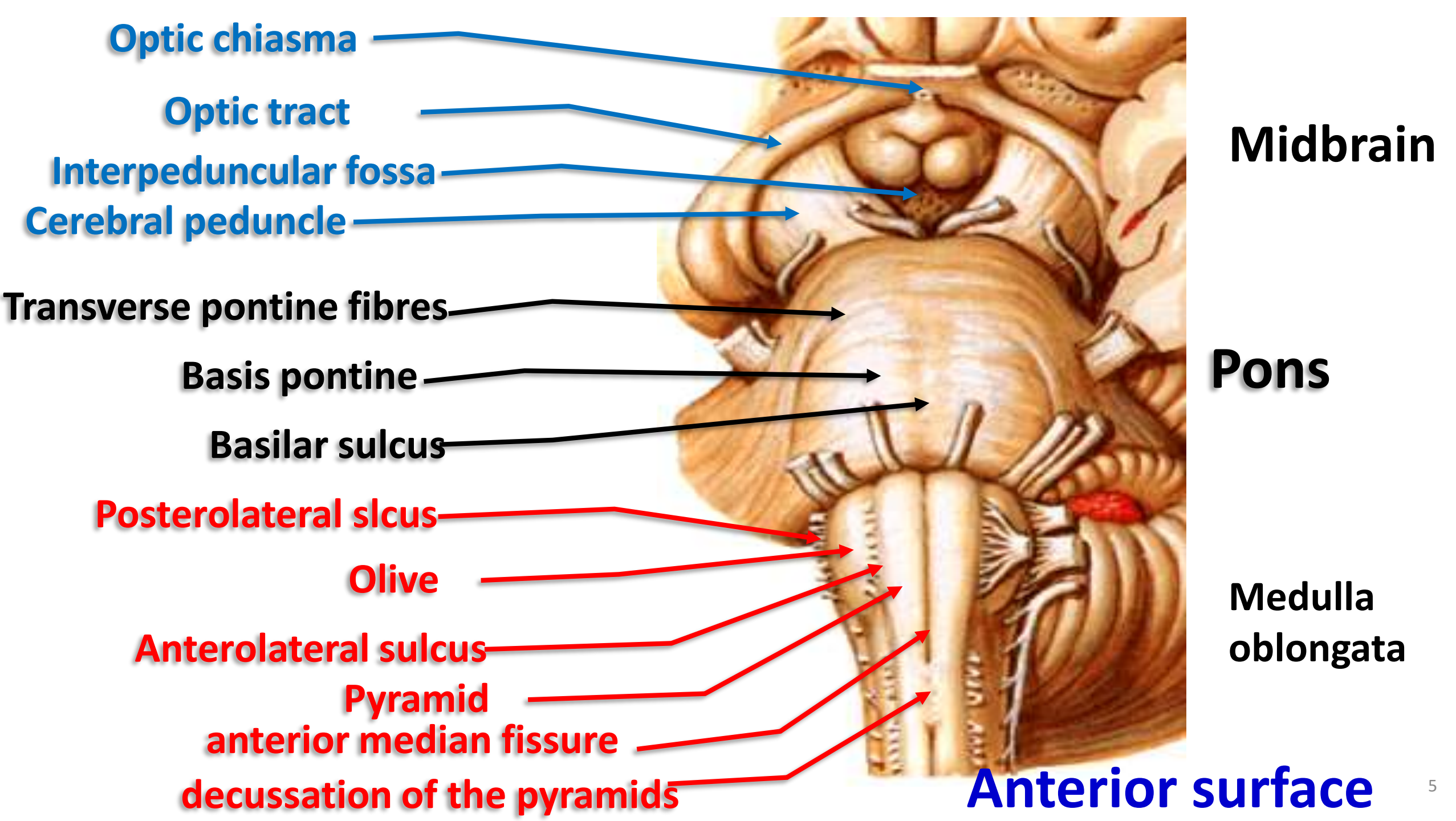
Brain stem connects the narrow spinal cord with the expanded forebrain



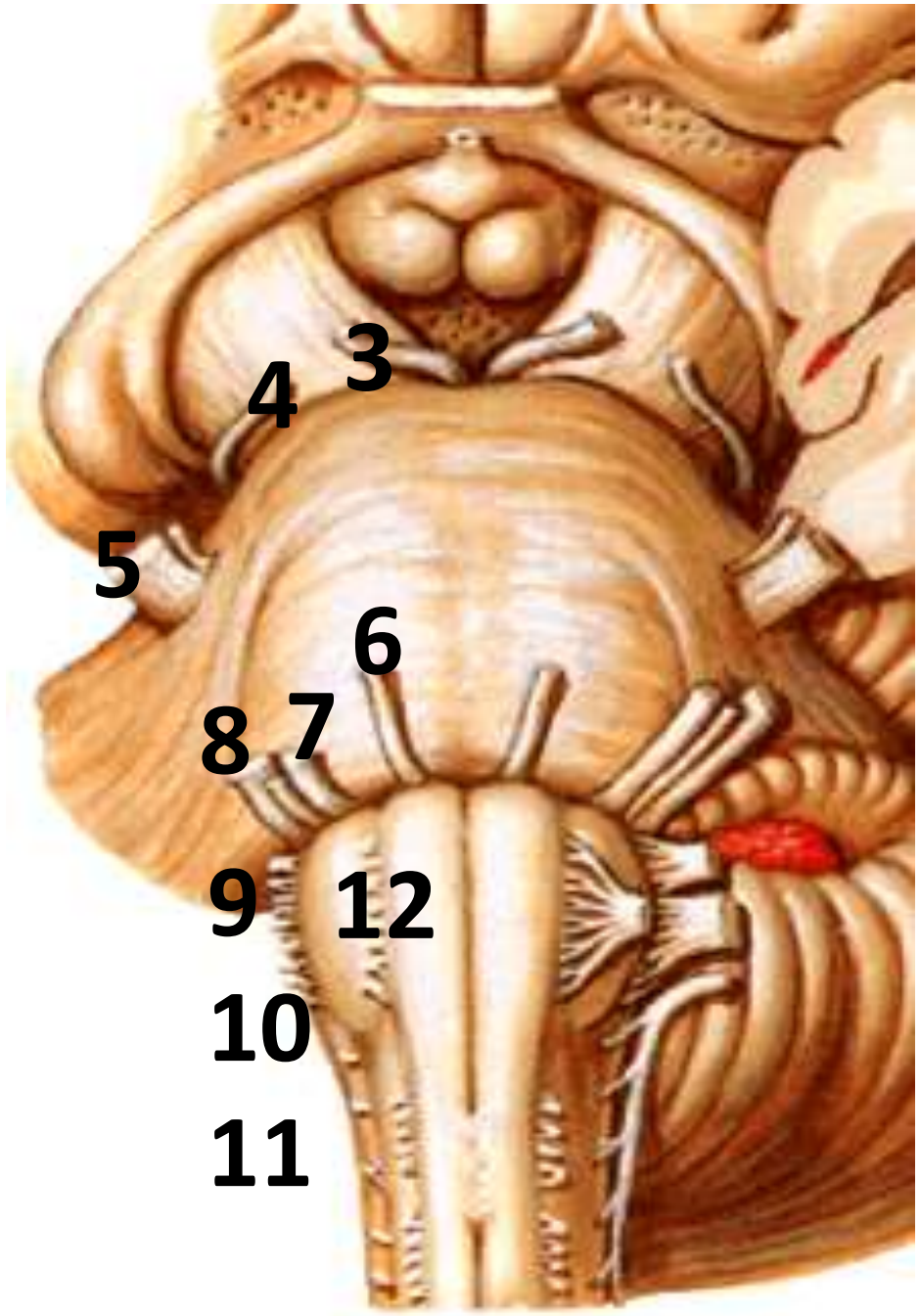

Thalamus
Cerebral aqueduct
4th ventricle
Midbrain
cerebellum
Pons
Medulla oblongata
Central canal

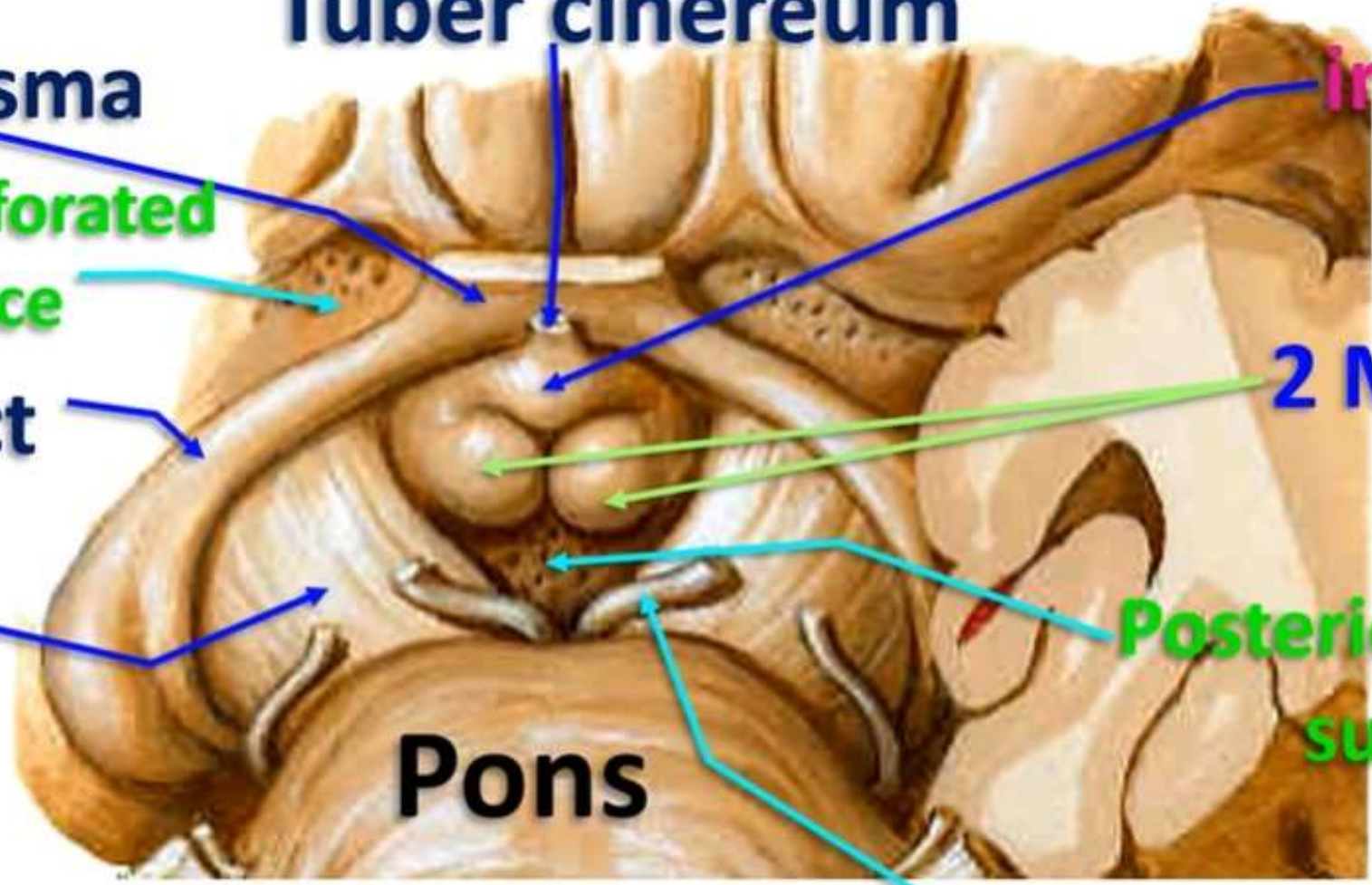
Anterior surface of the brainstem



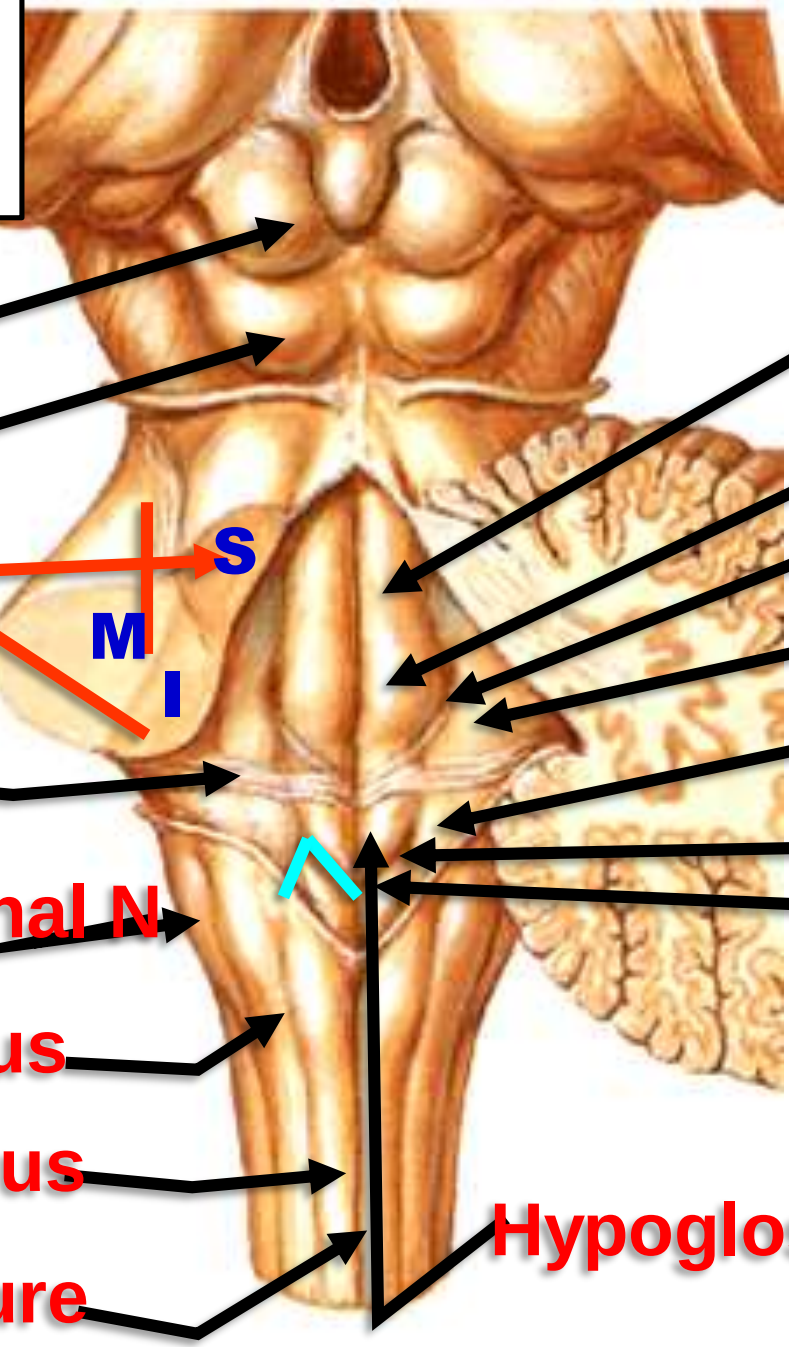

Optic chiasma
Optic tract
Interpeduncular fossa
Cerebral peduncle
Transverse pontine fibres
Basis pontine
Basilar sulcus
Posterolateral slcus
Olive
Anterolateral sulcus
Pyramid
anterior median fissure
decussation of the pyramids
Midbrain
Pons
Medulla oblongata
Anterior surface

Exit of the Cranial nerves from the anterior surface




Tuber cinereum
Optic chiasma
infundibulum
Anterior perforated substance
2 Mammillary bodies
Optic tract
Cerebral peduncle
Posterior perforated substance
Pons
Oculomotor nerve
Interpeduncular fossa

Posterior surface of brainstem



Superior colliculus

Inferior colliculus

Cerebellar peduncles

Stria medullaris

Spinal tract of trigeminal N

Cuneate tract & nucleus

Gracile tract & nucleus

Posterior median fissure

Medial eminence

Facial colliculus

Superior fovea

Vestibular area

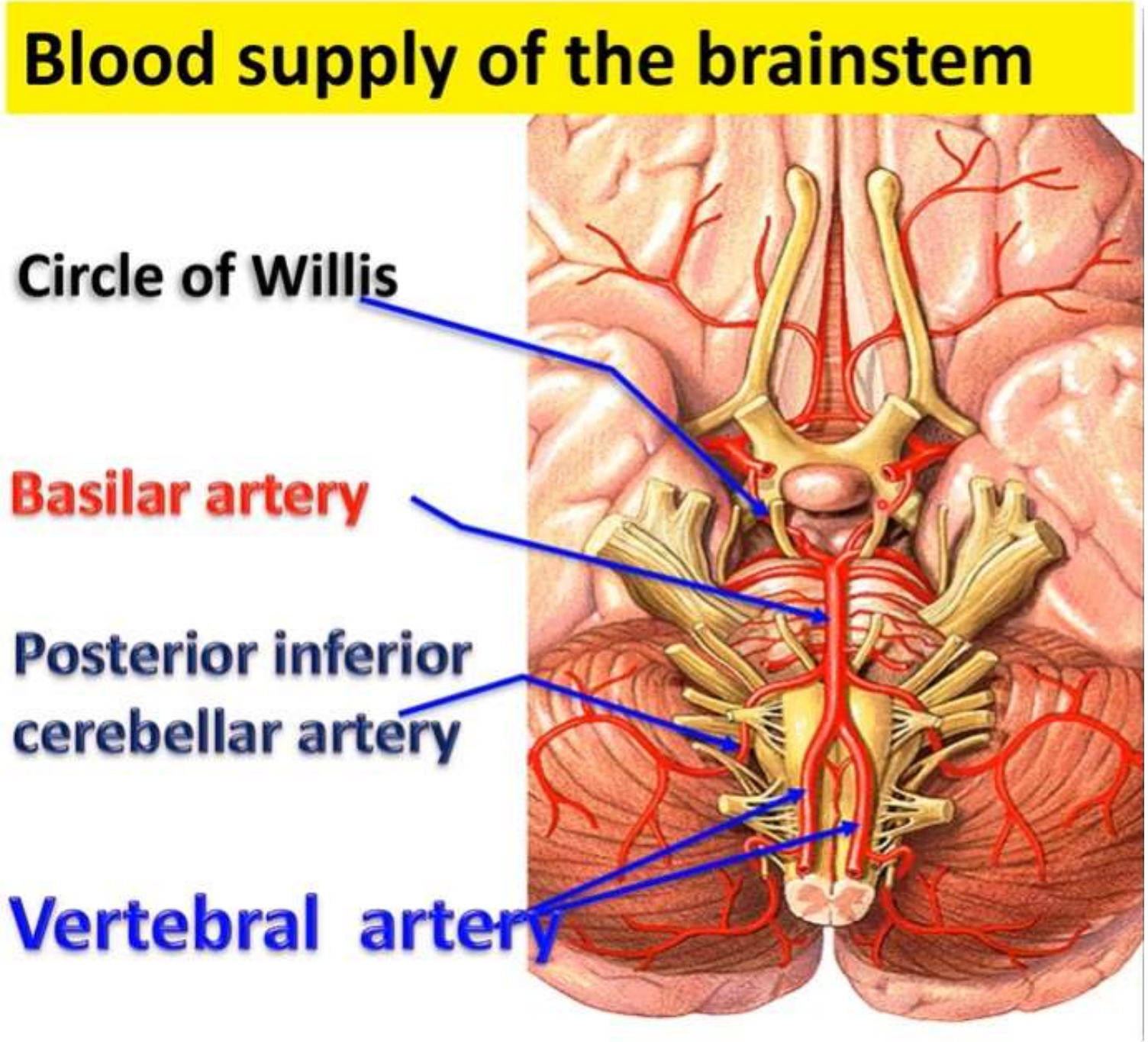
Vestibular area

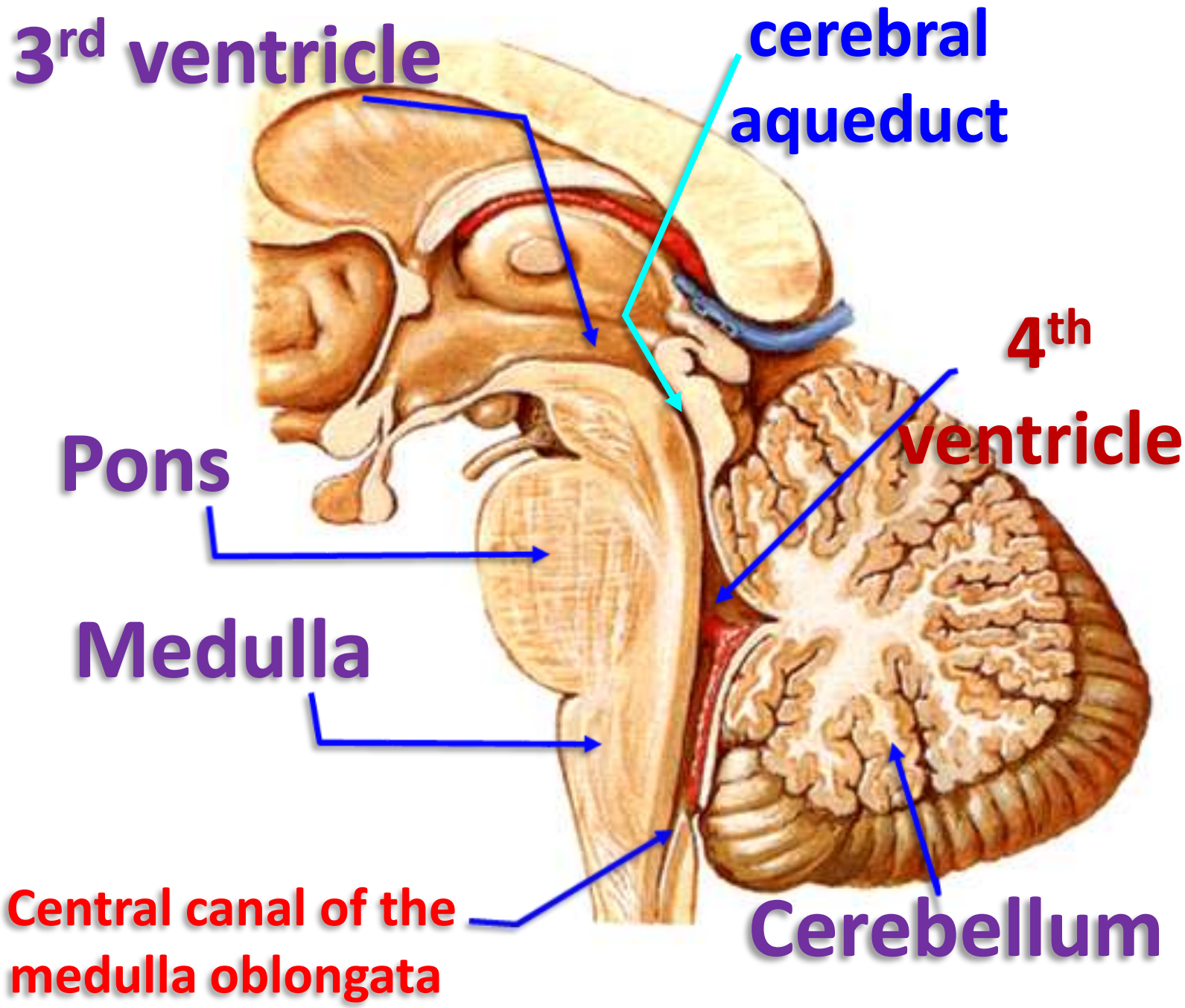
Inferior fovea

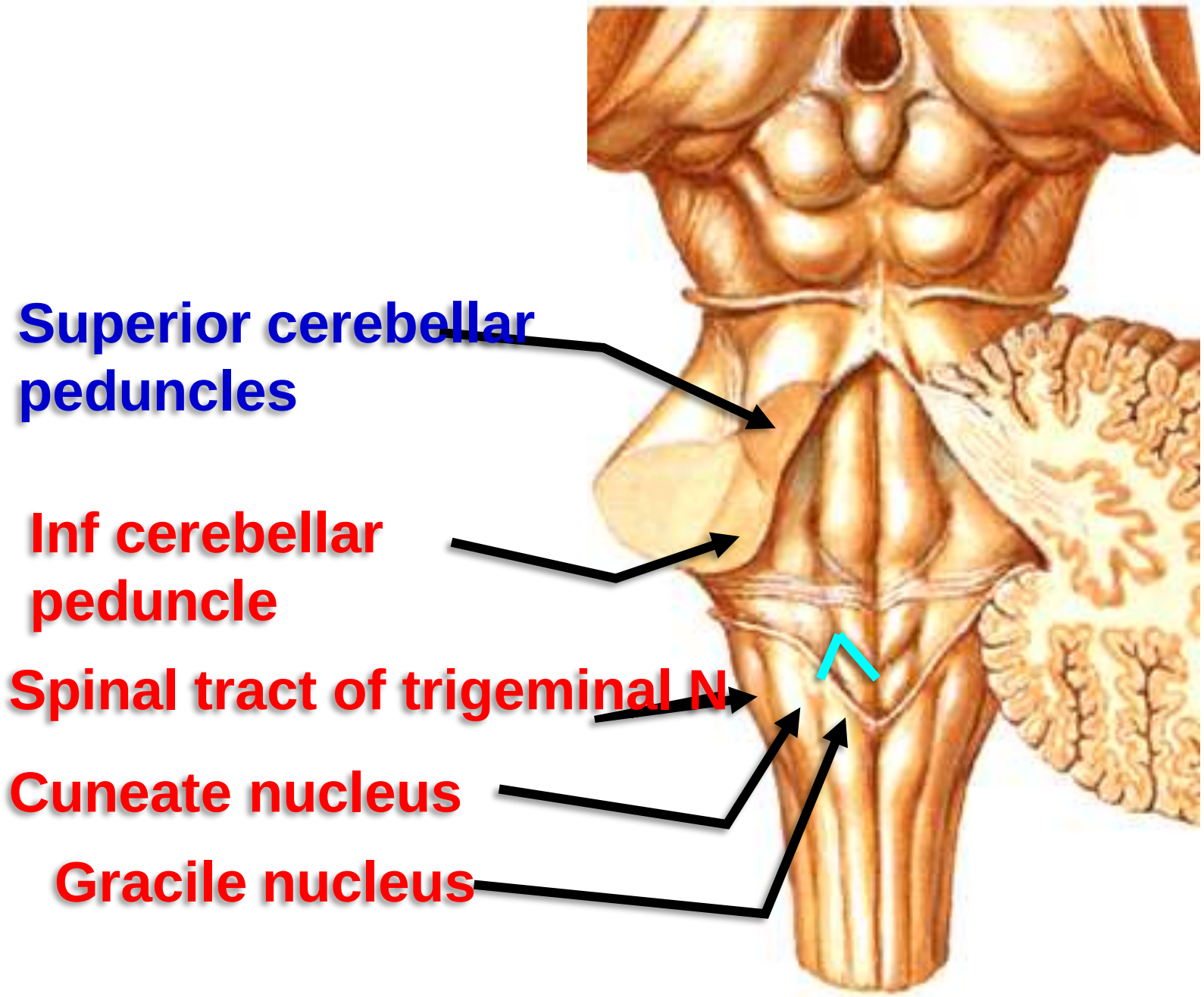
Vagal area

Hypoglossal area

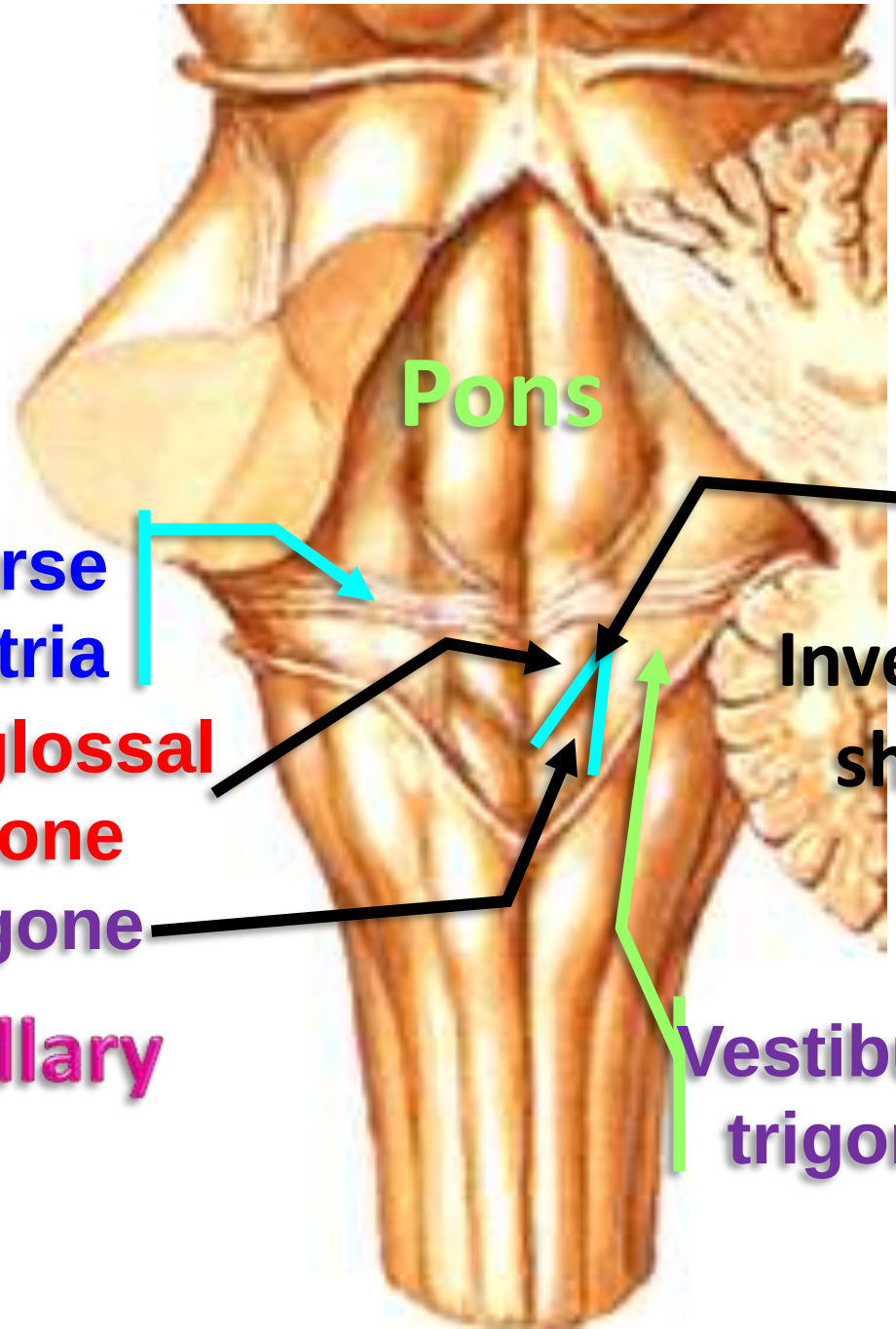
Blood supply of the brainstem




3rd ventricle
cerebral aqueduct
4th ventricle
Pons
Medulla
Central canal of the medulla oblongata
Cerebellum


Superior cerebellar peduncles
Inf cerebellar peduncle
Spinal tract of trigeminal N
Cuneate nucleus
Gracile nucleus

The posterior surface of the superior half of the medulla oblongata



Floor

Pons

Inferior fovea

Transverse medullary stria

Inverted V-shaped

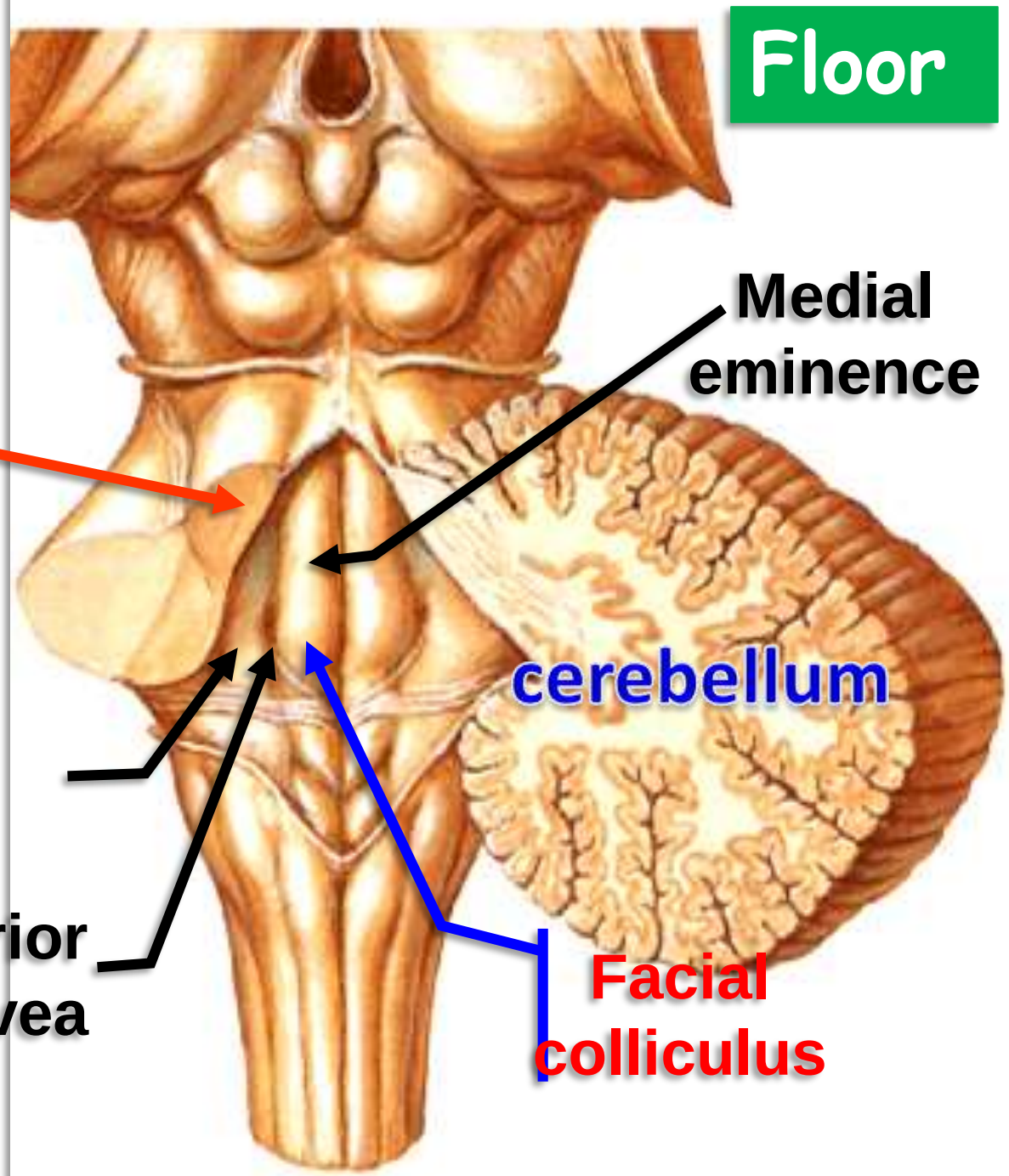
Hypoglossal trigone

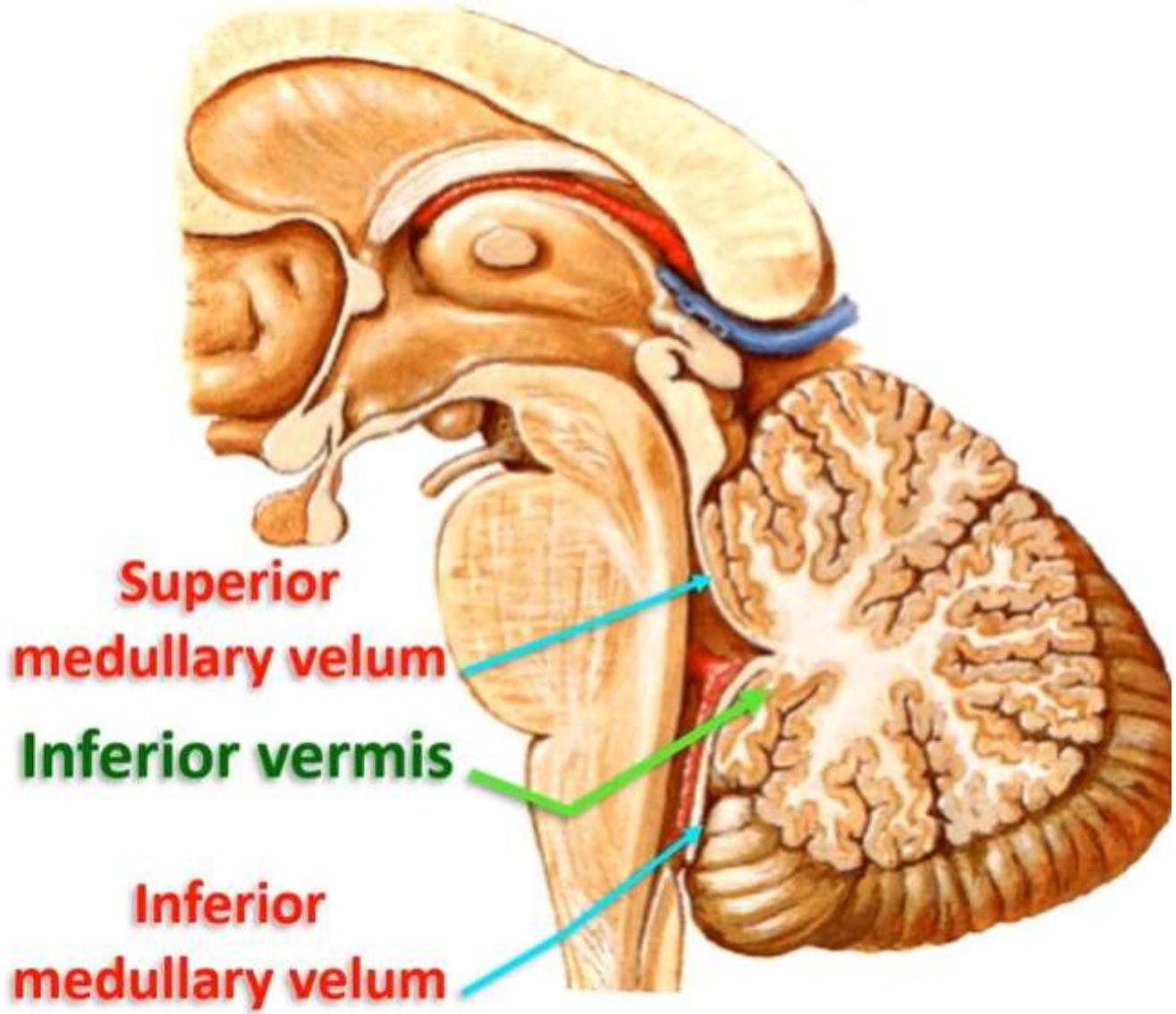
Vagal trigone

Lower Medullary part

Vestibular trigone

Upper Pontine part




Superior
medullary velum
Inferior vermis
Inferior
medullary velum

Cerebral aqueduct

4th ventricle

Upper part of roof

Midbrain

Pons

Floor

Cerebellum

Lower part of roof

Midbrain

choroid plexuses

Medulla Oblongata

Foramen of Magendie

Tela choroidea

Central canal of medulla

Openings

Recesses

MENINGES OF THE BRAIN

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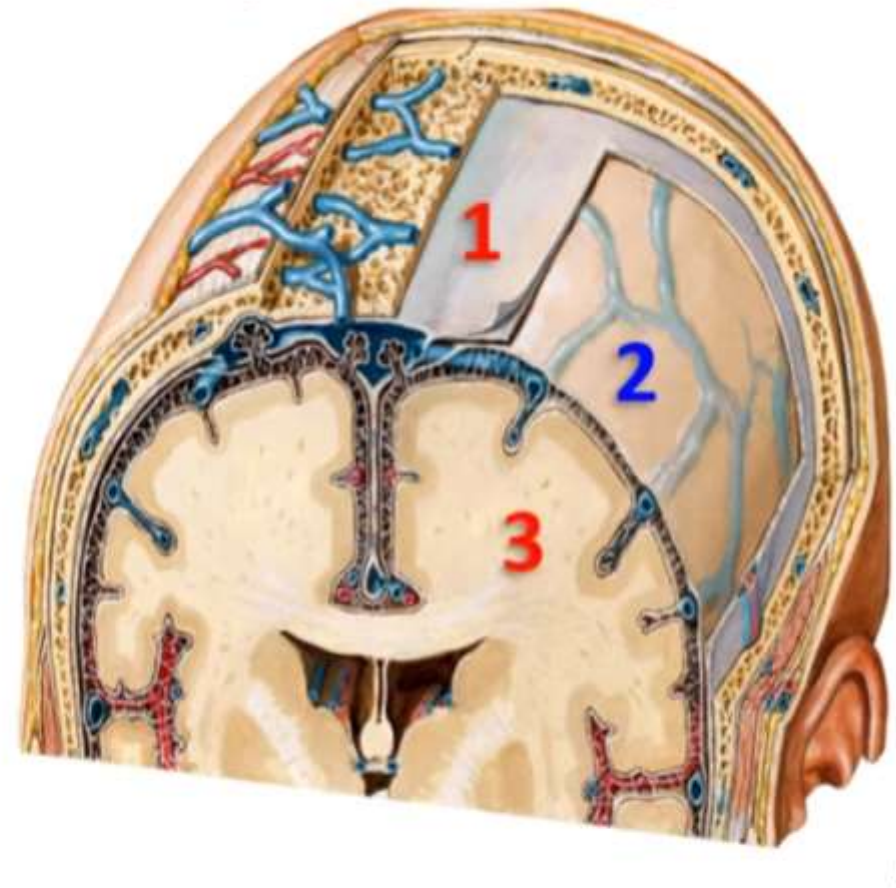


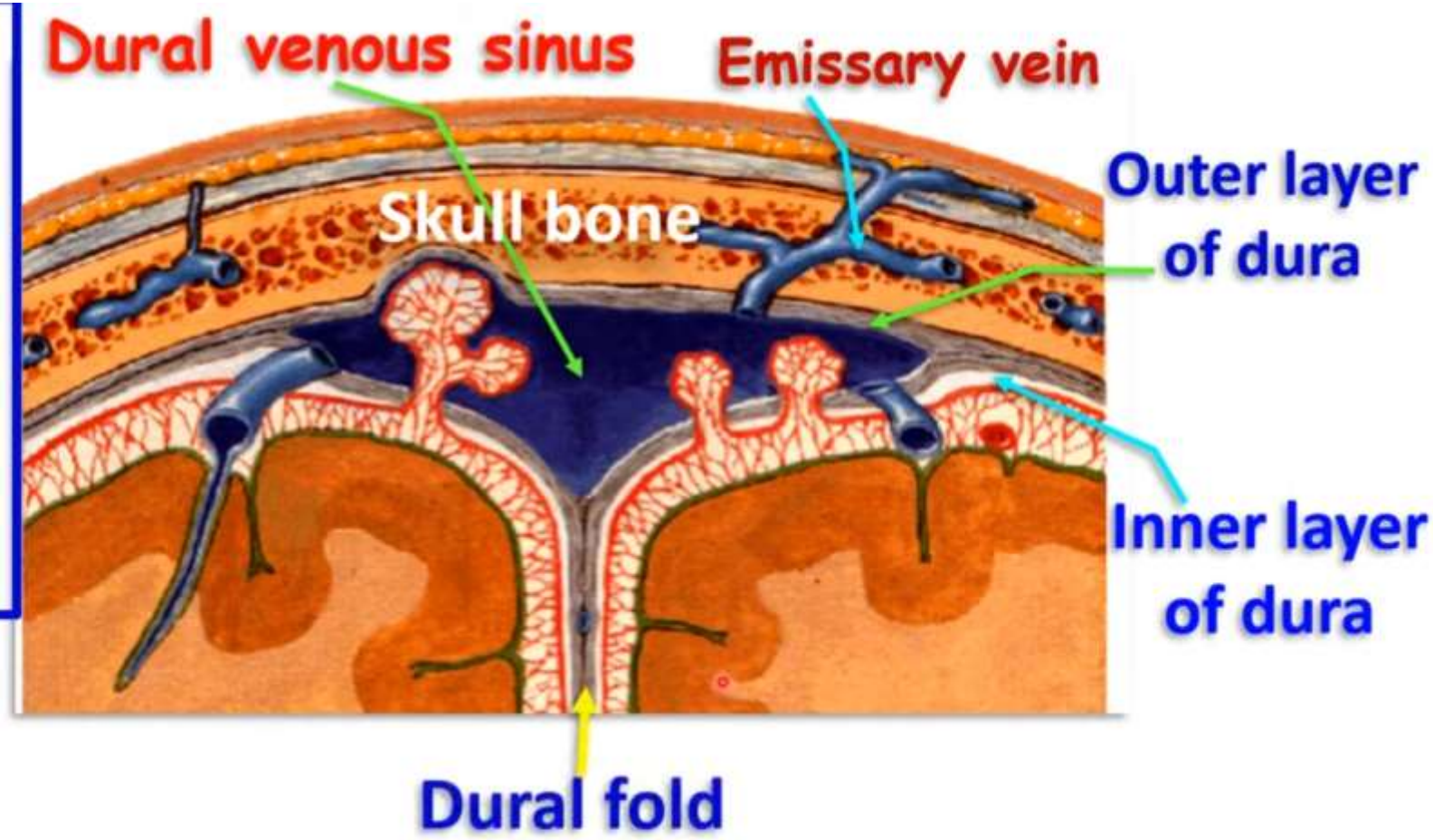
CNS is enclosed by three layers or membranes called meninges

1- Dura mater
2- Arachnoid mater
3- Pia mater

- **DURA MATER**

- It is formed of a strong white fibrous tissue.
- It consists of 2 layers:

1) an outer layer
2) An inner layer

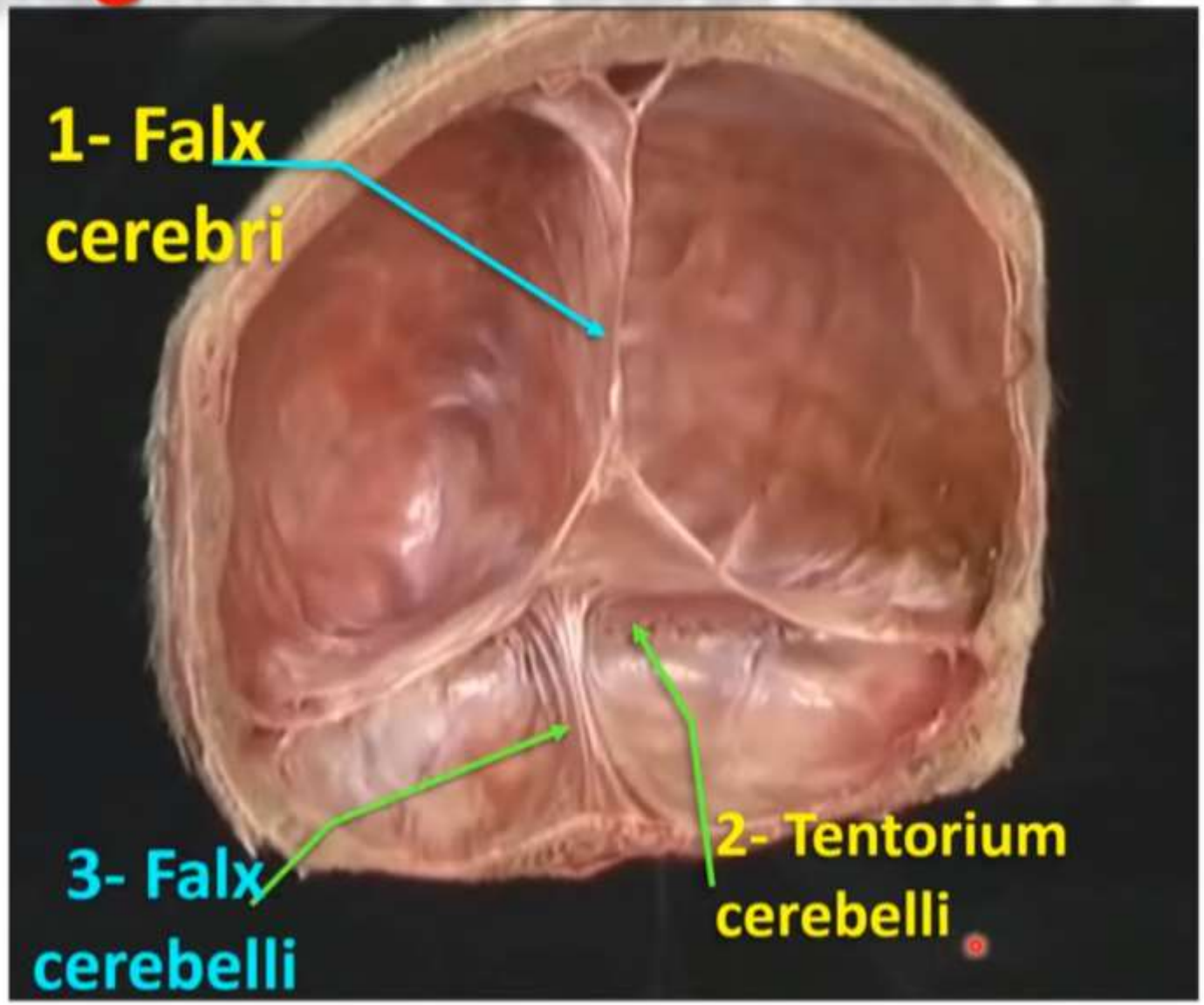


- These 2 fibrous layer are closely adherent together except in certain areas where:

(1) The inner layer separates from the outer layer to form **dural venous sinus.**

(2) The inner layer is reduplicated to form **dural folds.**

Arrangements of Dural folds T.S



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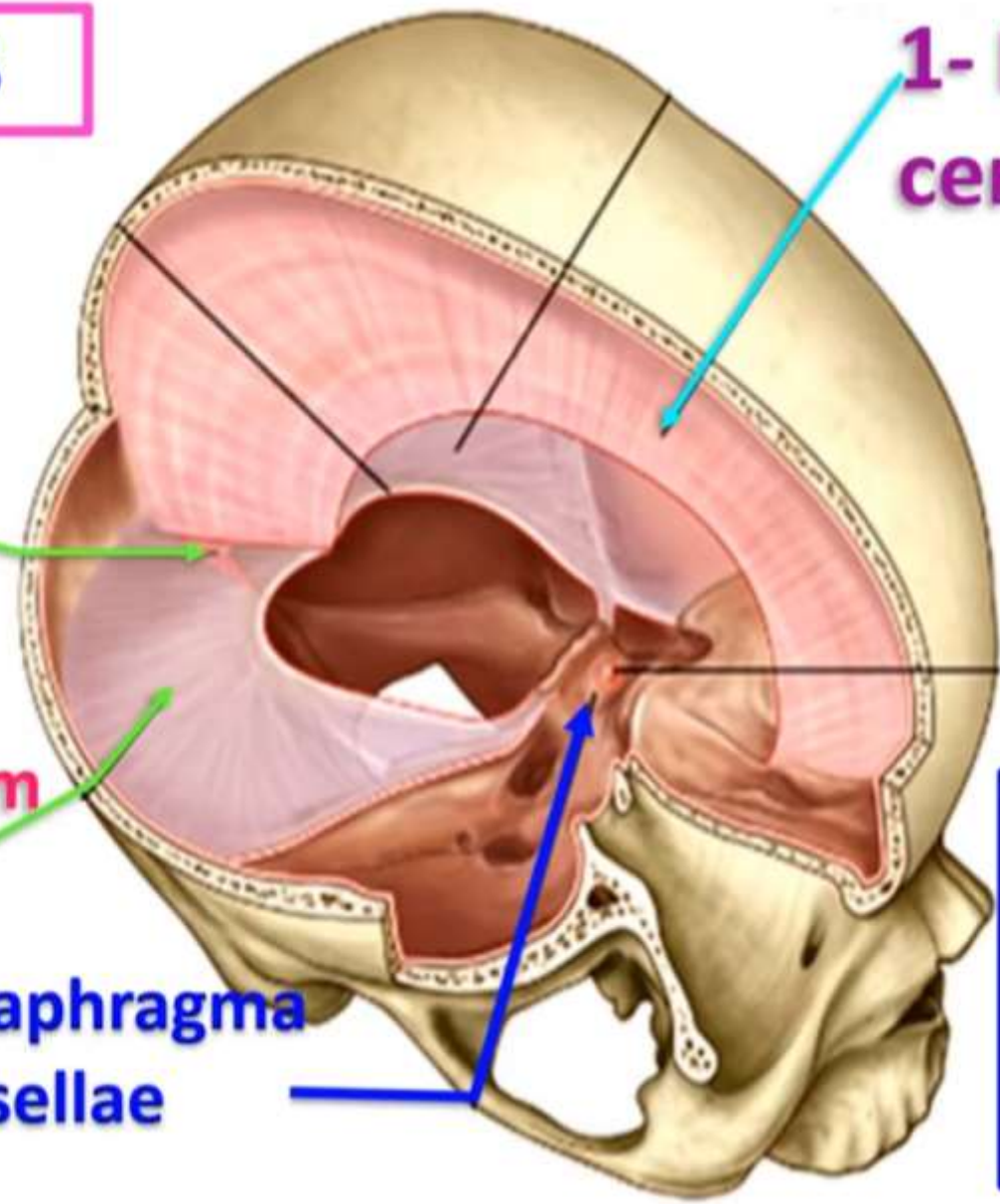
Dural folds L.S



1- Falx cerebri

3- Falx cerebelli

2- Tentorium cerebelli

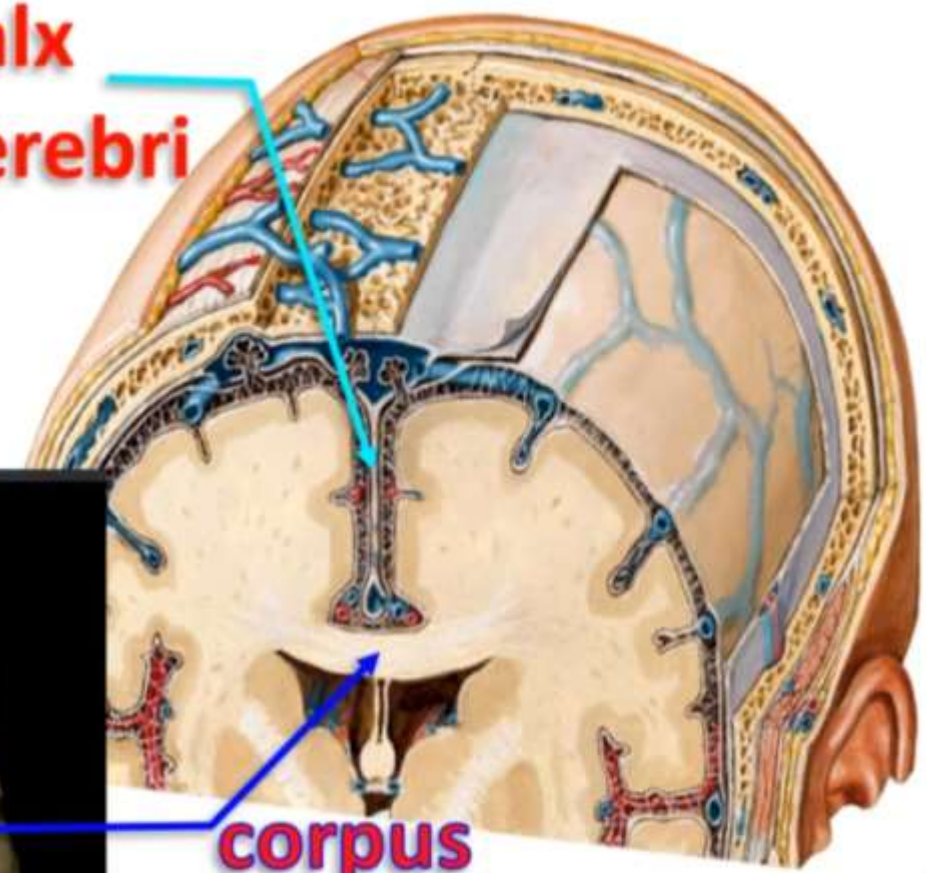
4- Diaphragma sellae

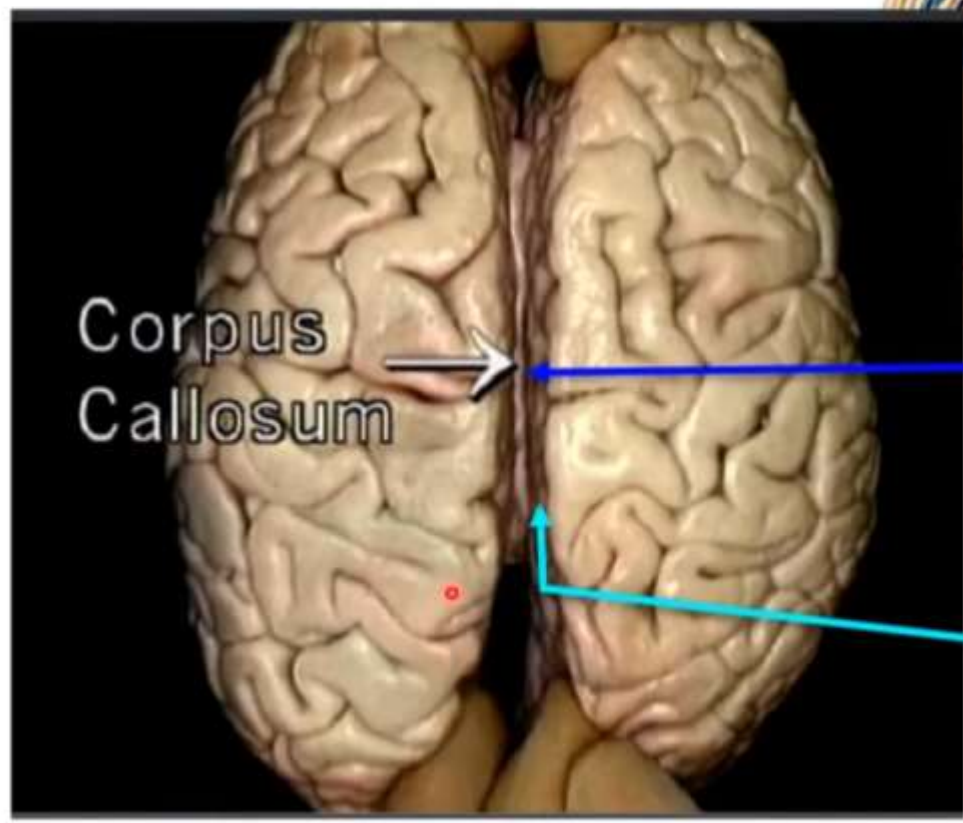
Sella turcica

5- Cavum trigeminale

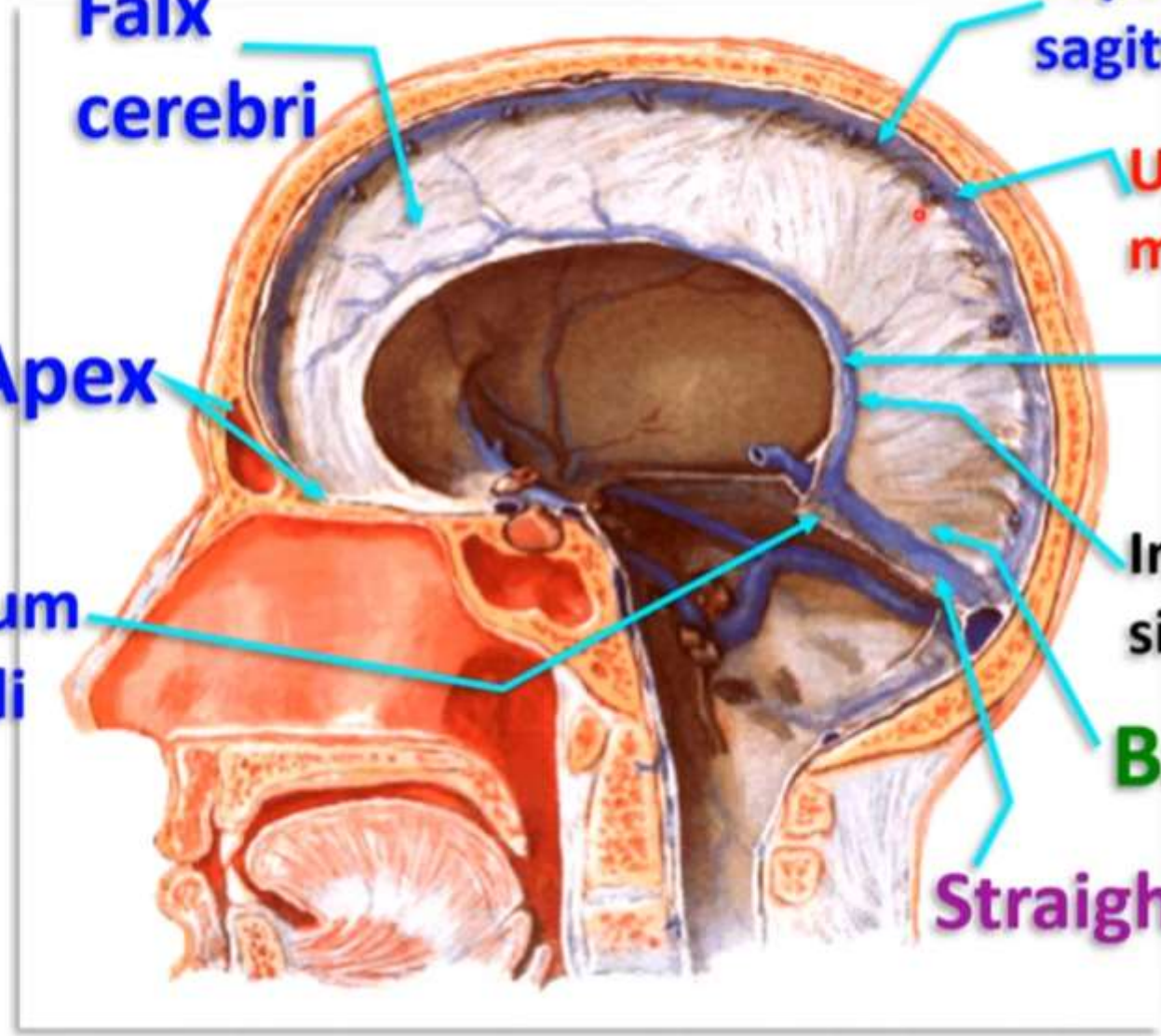
- It covers the trigeminal ganglion at the apex of the petrous part of the temporal bone.

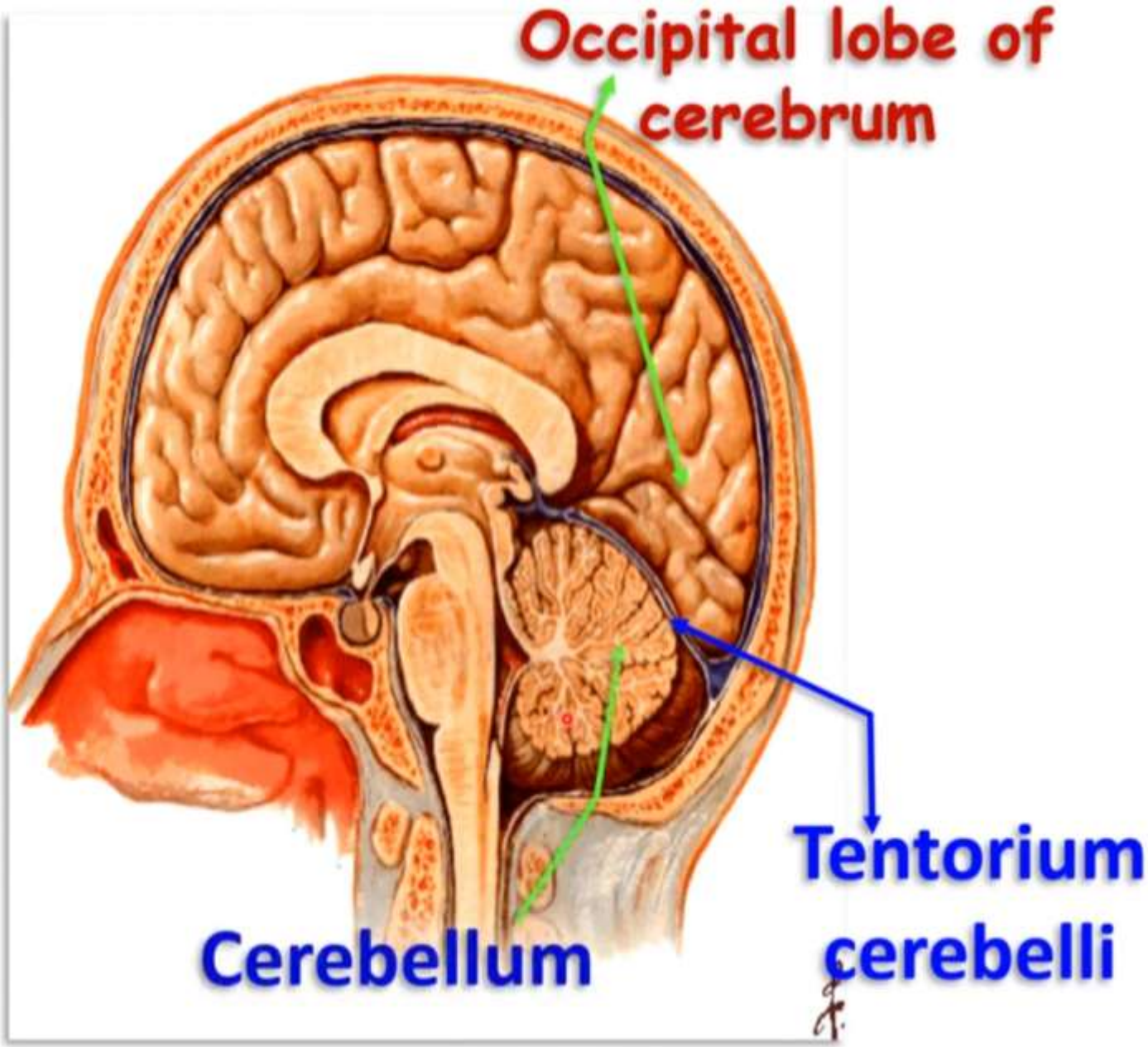
* **Site of Falx cerebri in** the median longitudinal fissure between the 2 cerebral hemispheres and above the corpus callosum.





Shape: sickle-shaped dural fold





- It is tent shaped and roofs the posterior cranial fossa separating the occipital lobe of cerebrum (above) from the cerebellum (below).

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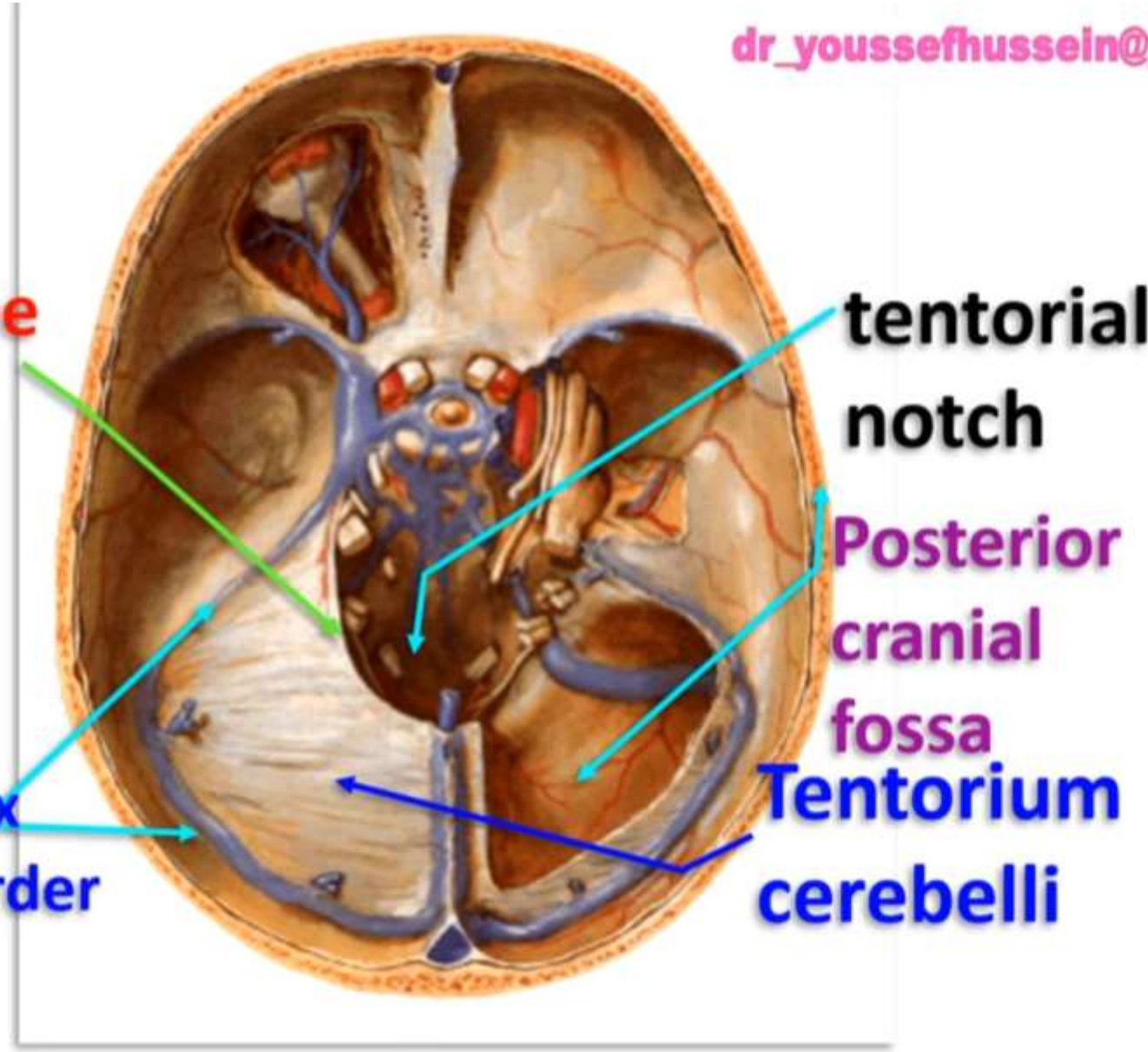
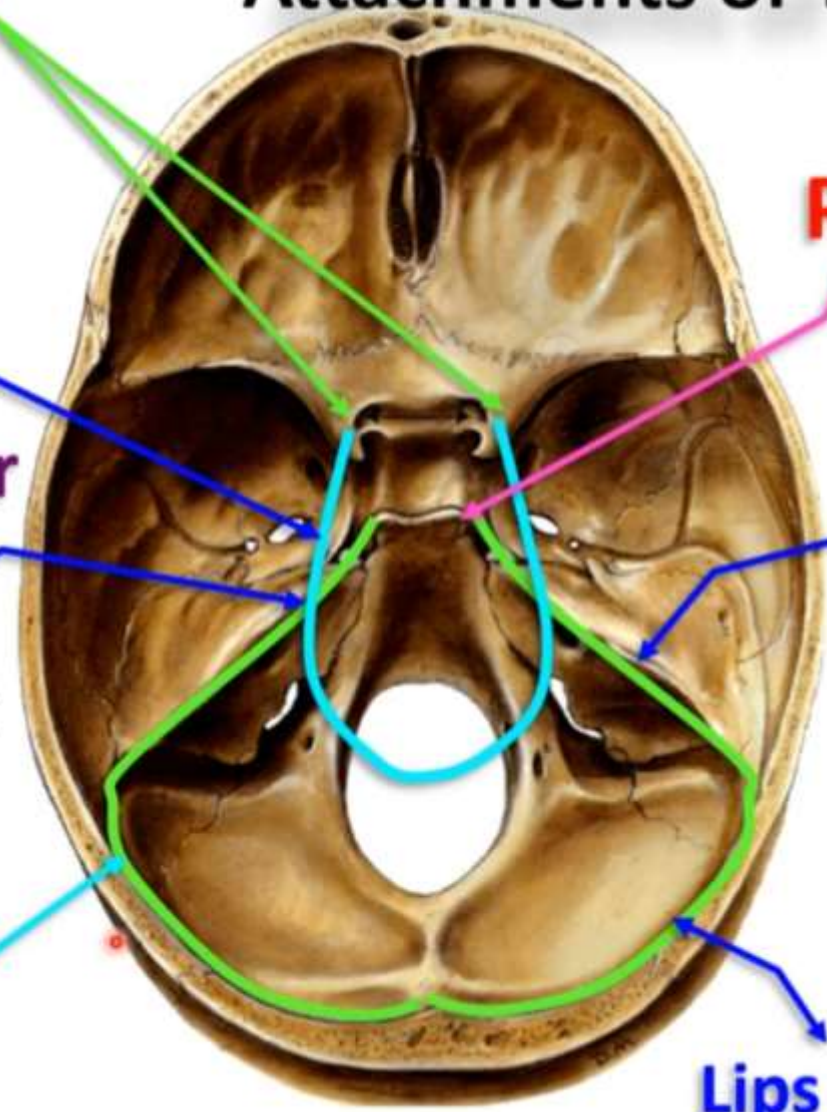


Attachments of Tentorium cerebelli



Anterior clinoid process

Posterior clinoid processes

Free inner concave border

Point of decussation

Upper border of Petrous part temporal bone lips of superior petrosal sulcus

Outer convex attached border

Lips of Transverse sulcus

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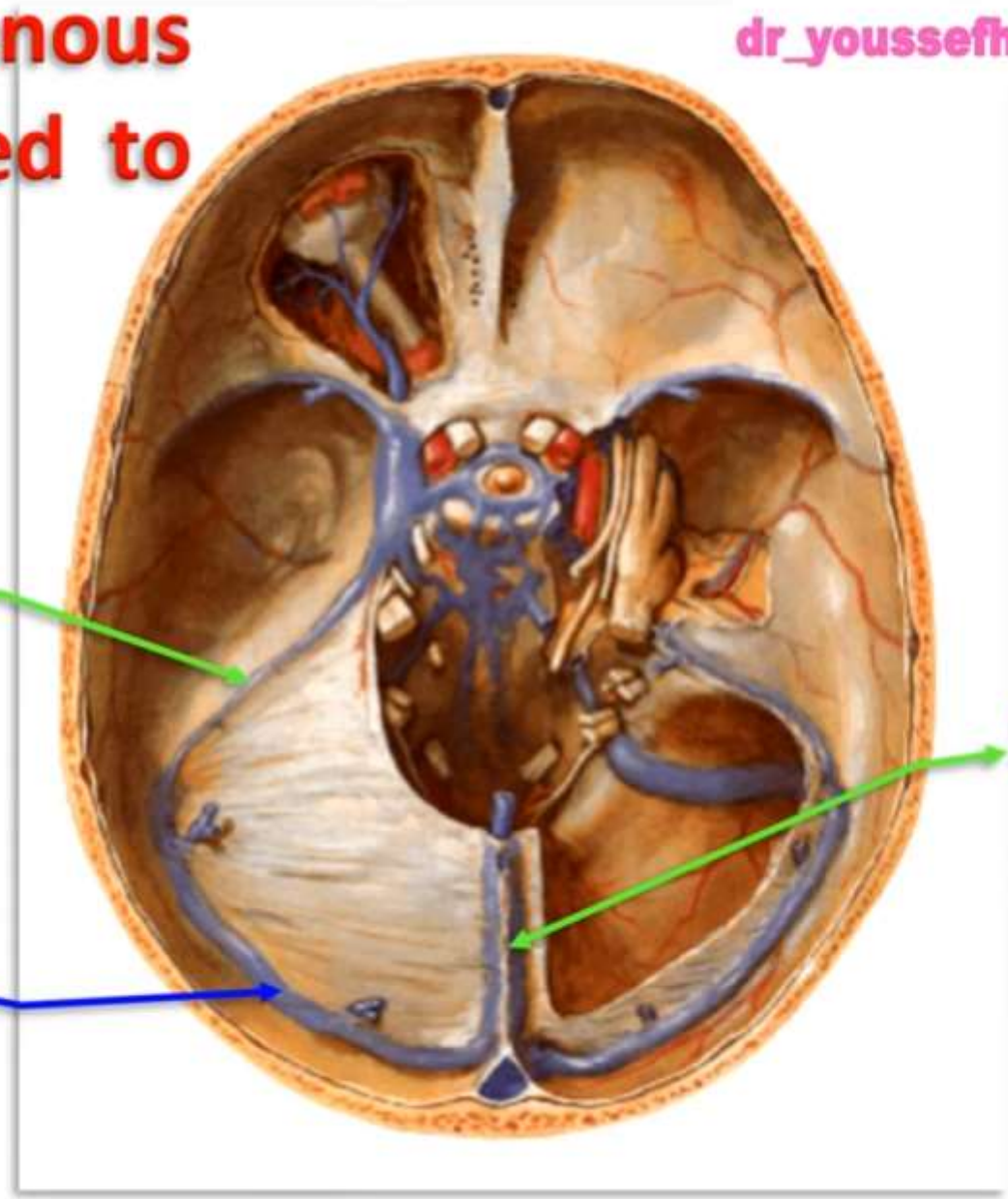
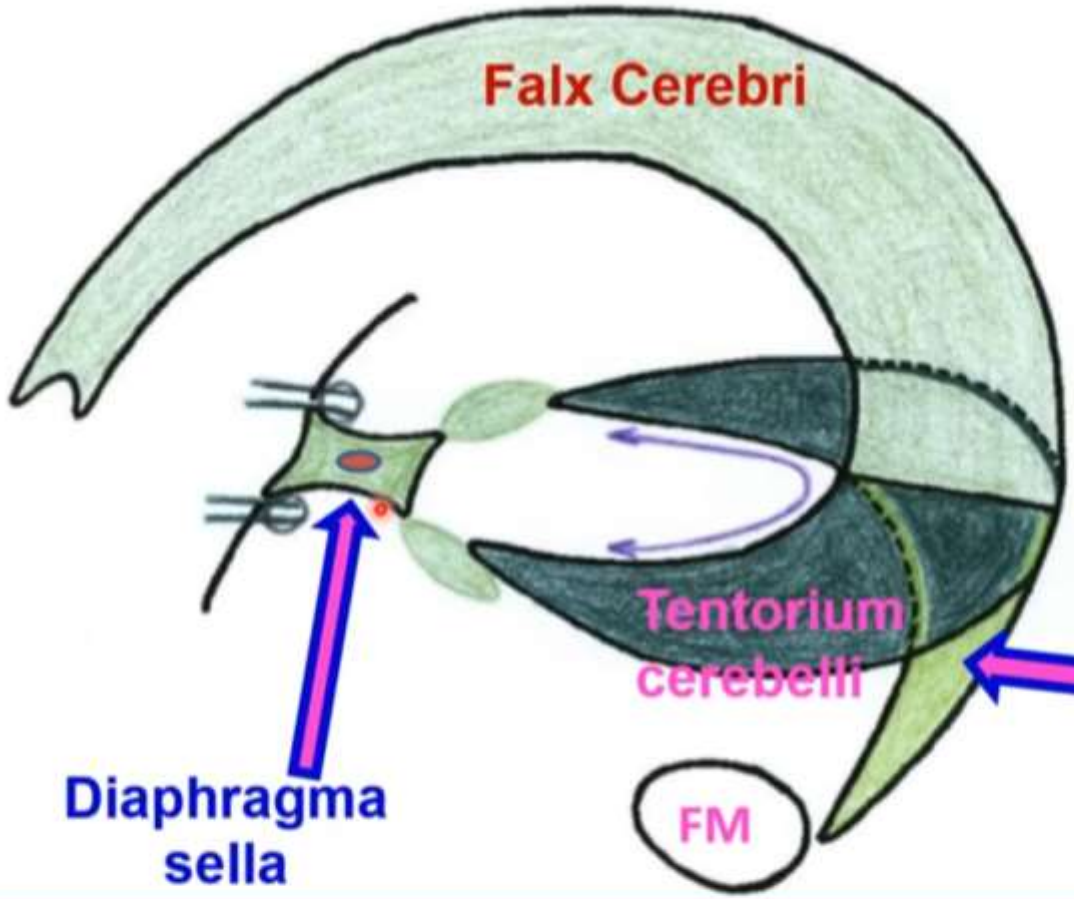
- **Dural venous sinuses related to tentorium cerebelli**





- It roofs the sella turcica above the pituitary gland.
- It stretches between the 4 clinoid processes.
- It has a central hole for the infundibulum of the pituitary gland.

• Falx Cerebelli

- **Site** : between the 2 cerebellar hemispheres
- **Shape**: triangular in shape.
- **Parts & attachments**:

(1) **Base**: above and is continuous with the lower layer of tentorium cerebelli.

(2) **Apex**; downward and reaches posterior border of foramen magnum.

(3) **Anterior (free) border**: projects forwards between the 2 cerebellar hemisheres.

(4) **Posterior (attached) border**: attached to internal occipital crest.

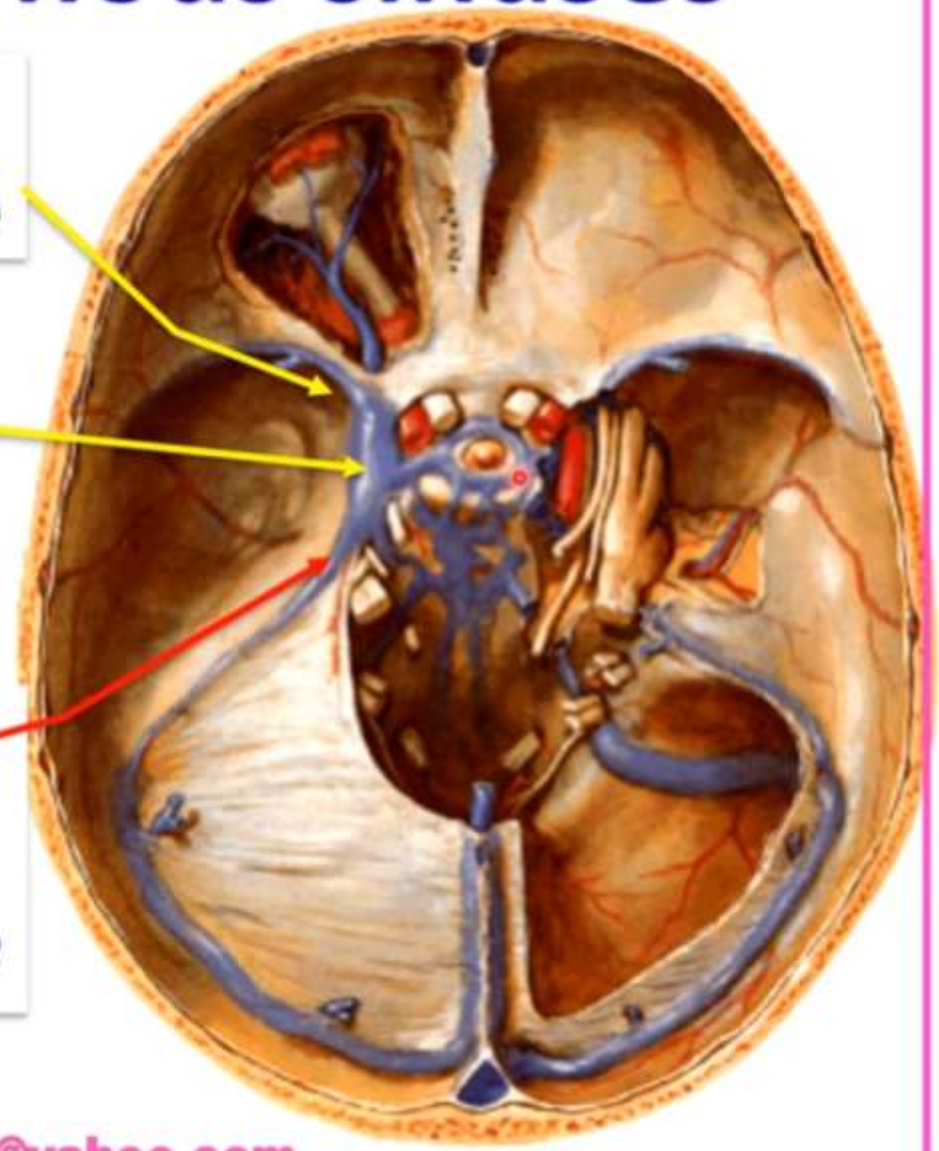
- **Venous sinuses related**: the **occipital sinus** runs in the posterior border.

Cavernous sinuses

Superior orbital fissure

Cavernous sinus

Apex of petrous temporal bone



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Relations of Cavernous sinuses

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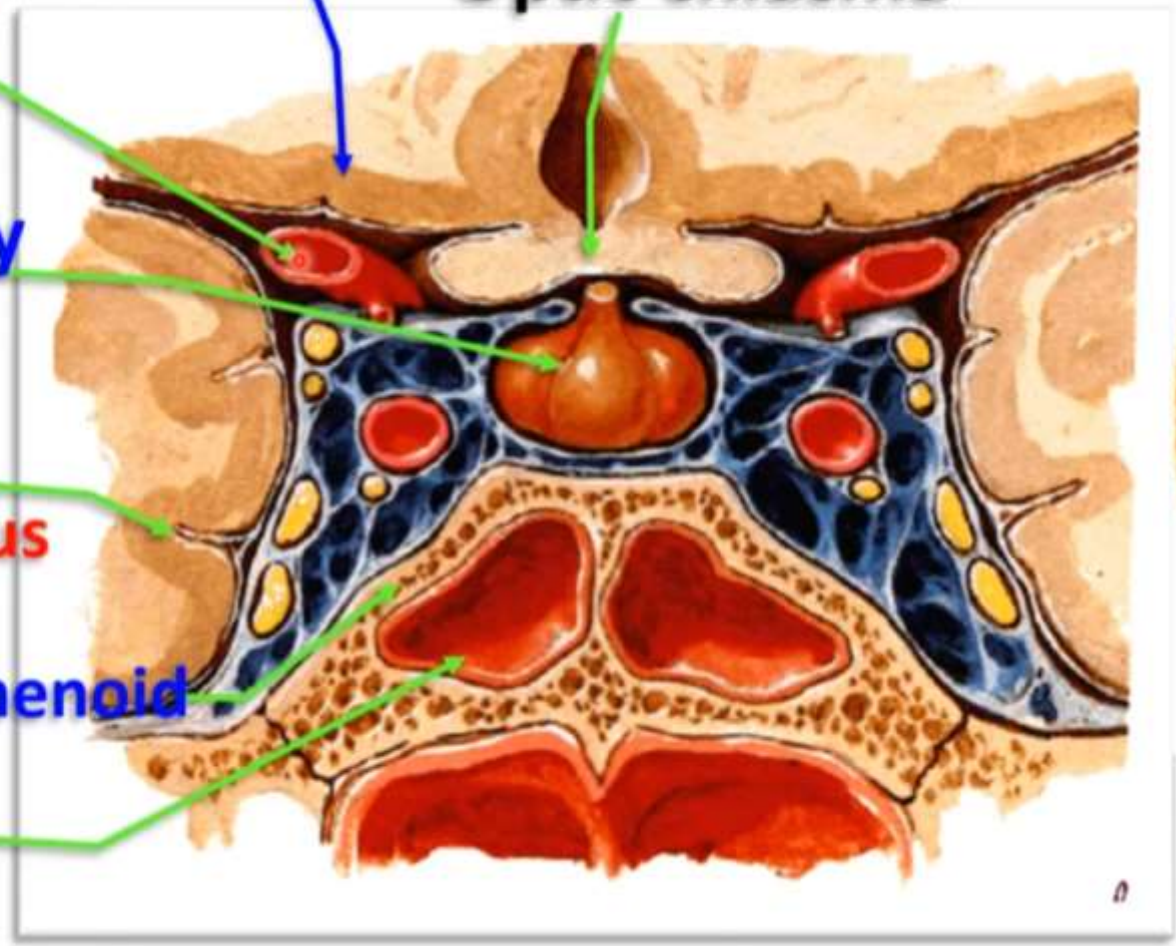
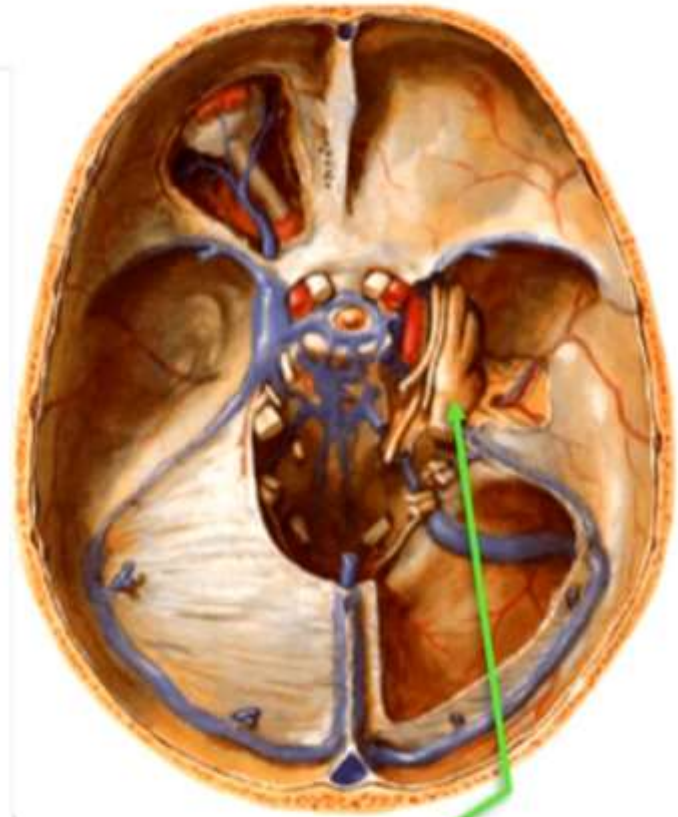




- Structures inside and in lateral wall of cavernous sinus

Lateral wall

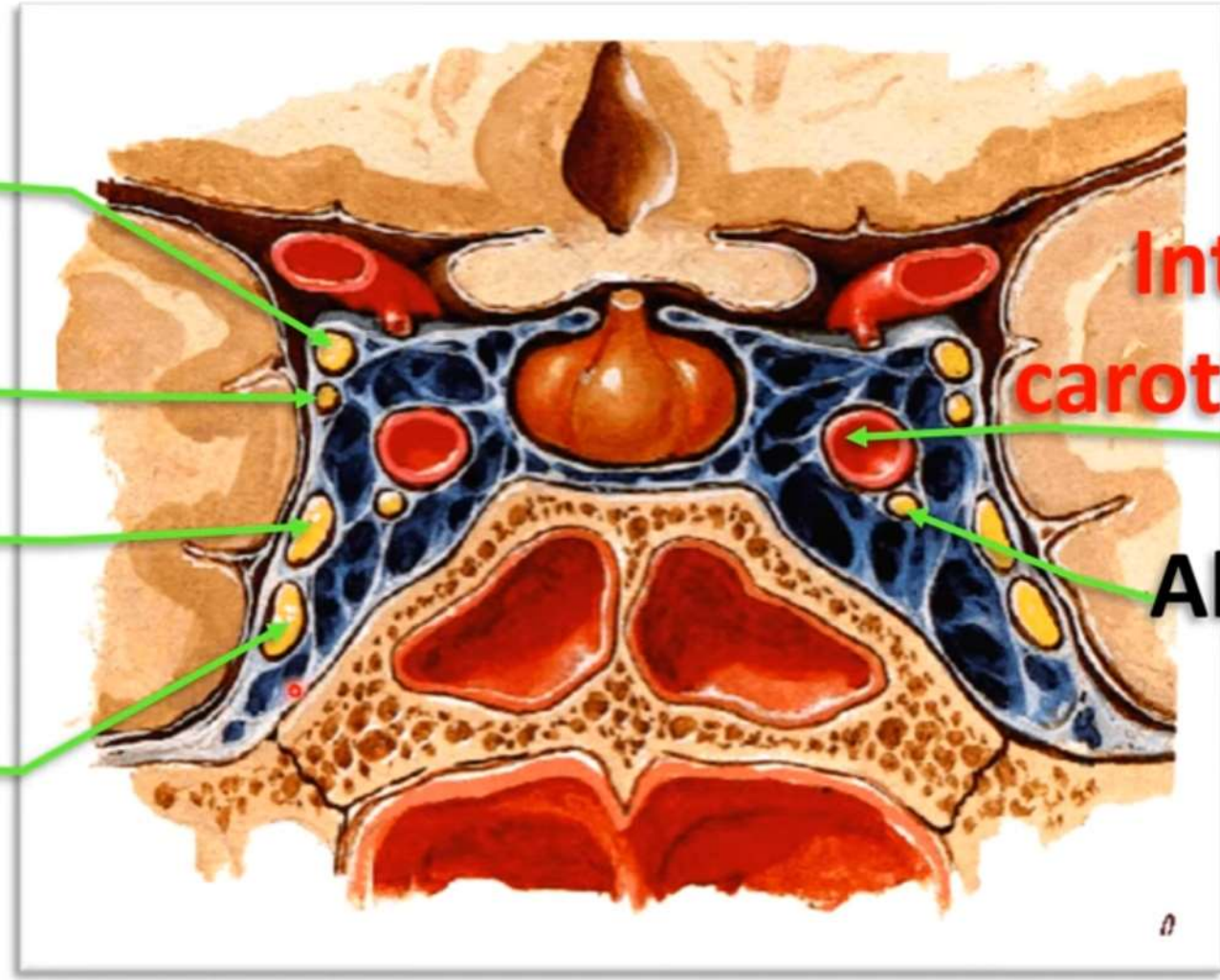
Inside

Oculomotor nerve

Trochlear nerve

Ophthalmic nerve

Maxillary nerve



Internal carotid artery

Abducent nerve

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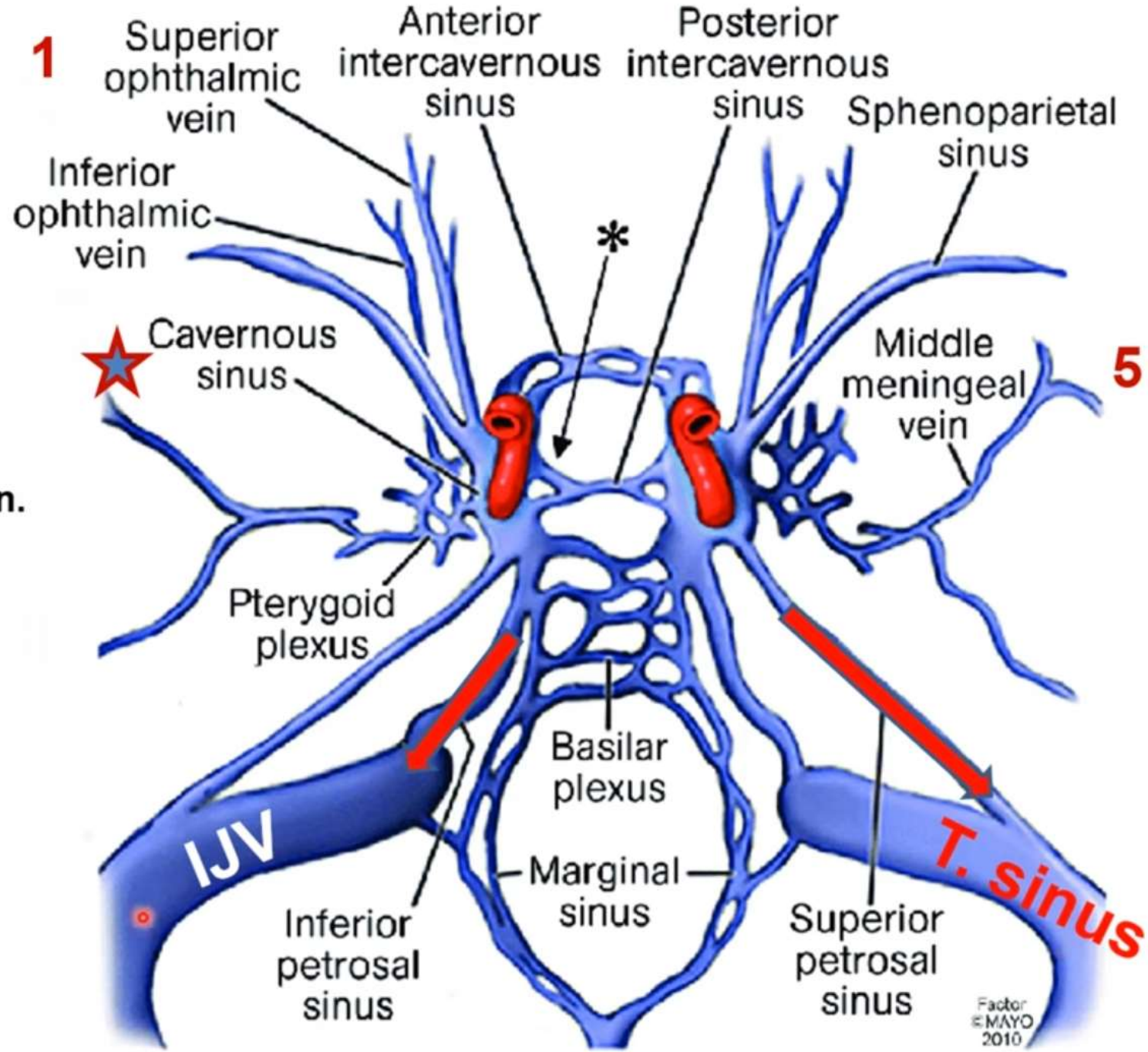
3 **Central vein of the retina.**

6 **Superficial Middle cerebral vein.**

- **Tributaries and Drainage of the cavernous sinus**



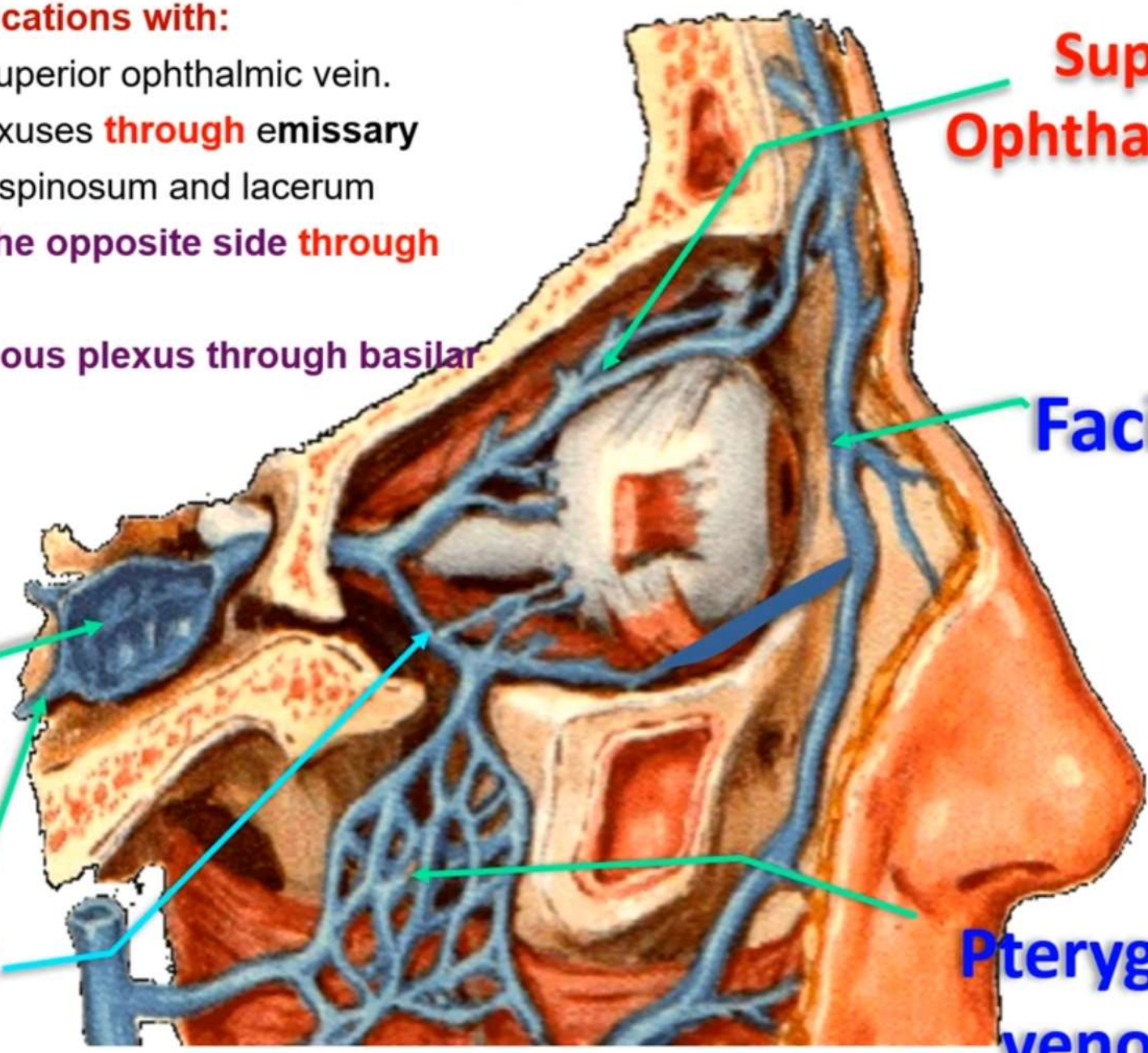
- **Communications with:**

1- Facial vein through superior ophthalmic vein.

2- Pterygoid venous plexuses **through** e**missary veins of foramen** ovale, spinosum and lacerum

3- Cavernous sinus of the opposite side through inter-cavernous sinuses.

4- Internal vertebral venous plexus through basilar plexus of vein



Superior Ophthalmic vein

Facial vein

Cavernous sinus

Intercavernous sinus

Emissary veins

Pterygoid venous Plexus

Superior sagittal sinus

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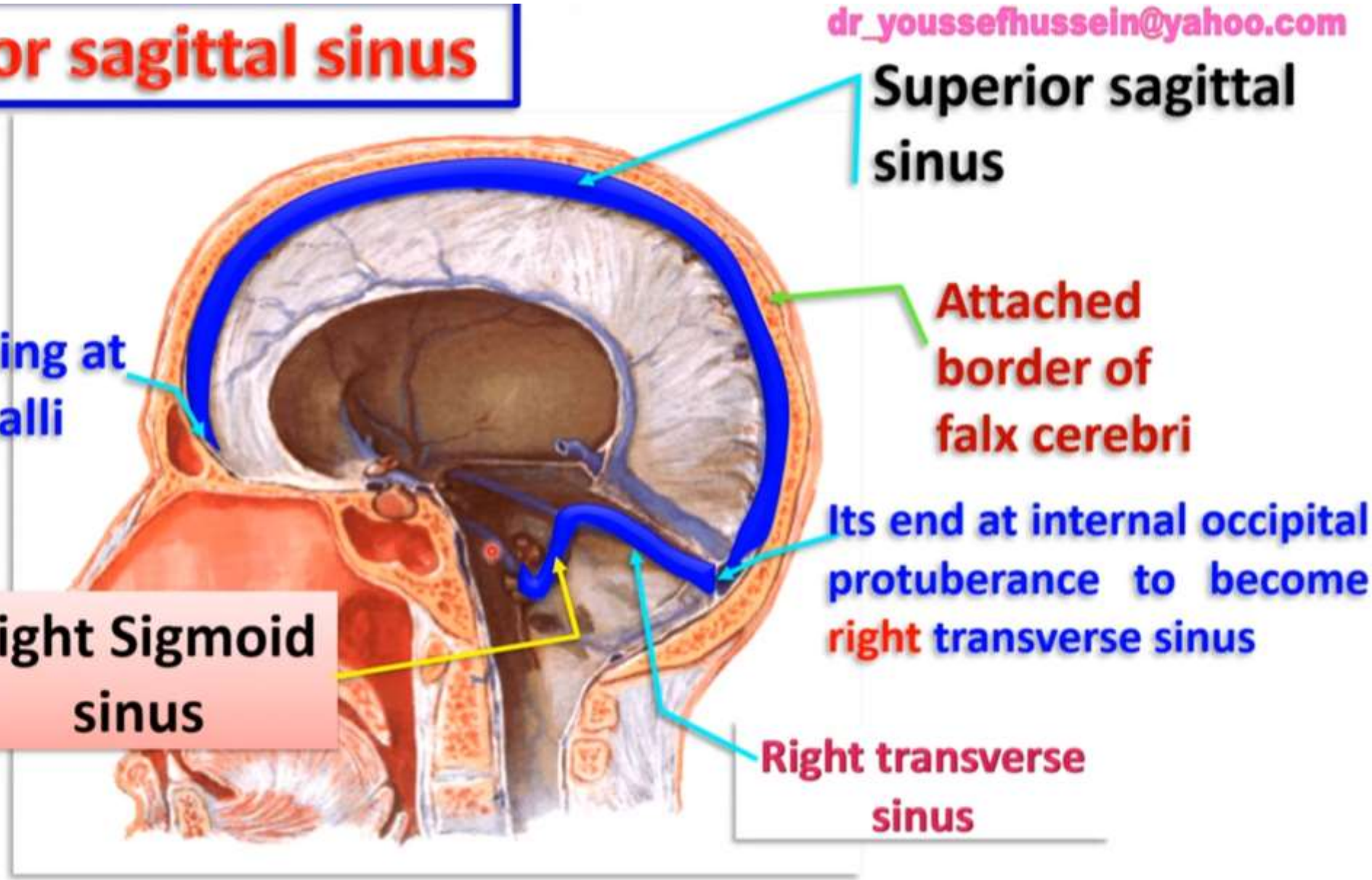
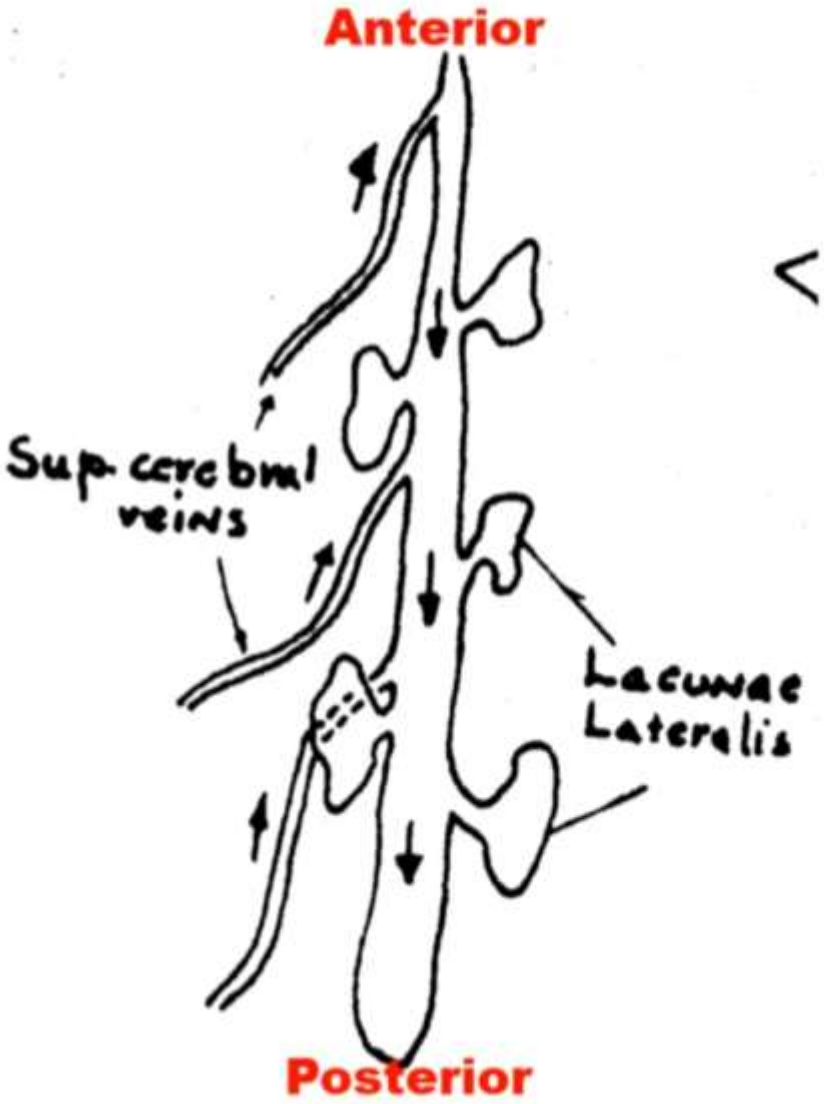
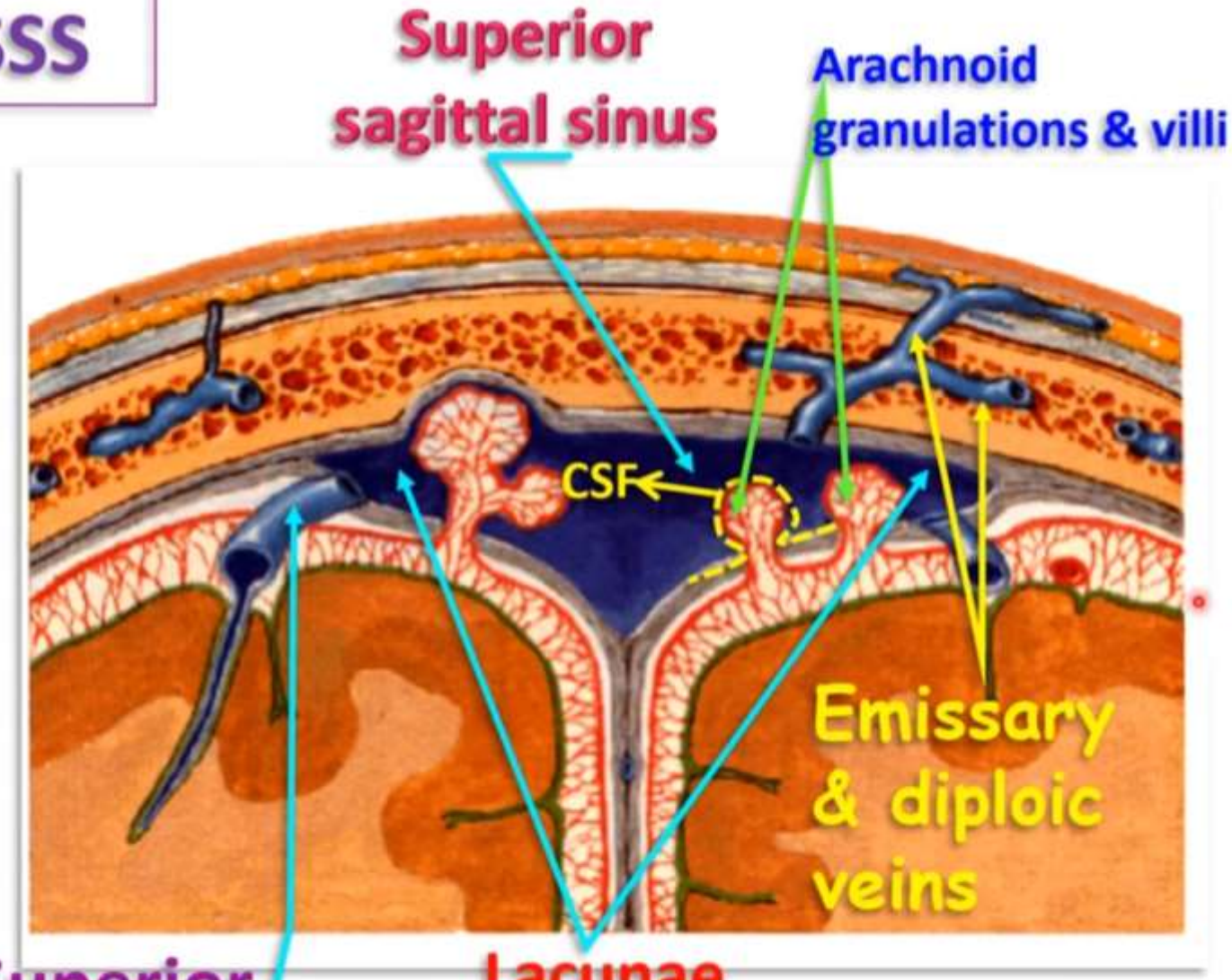
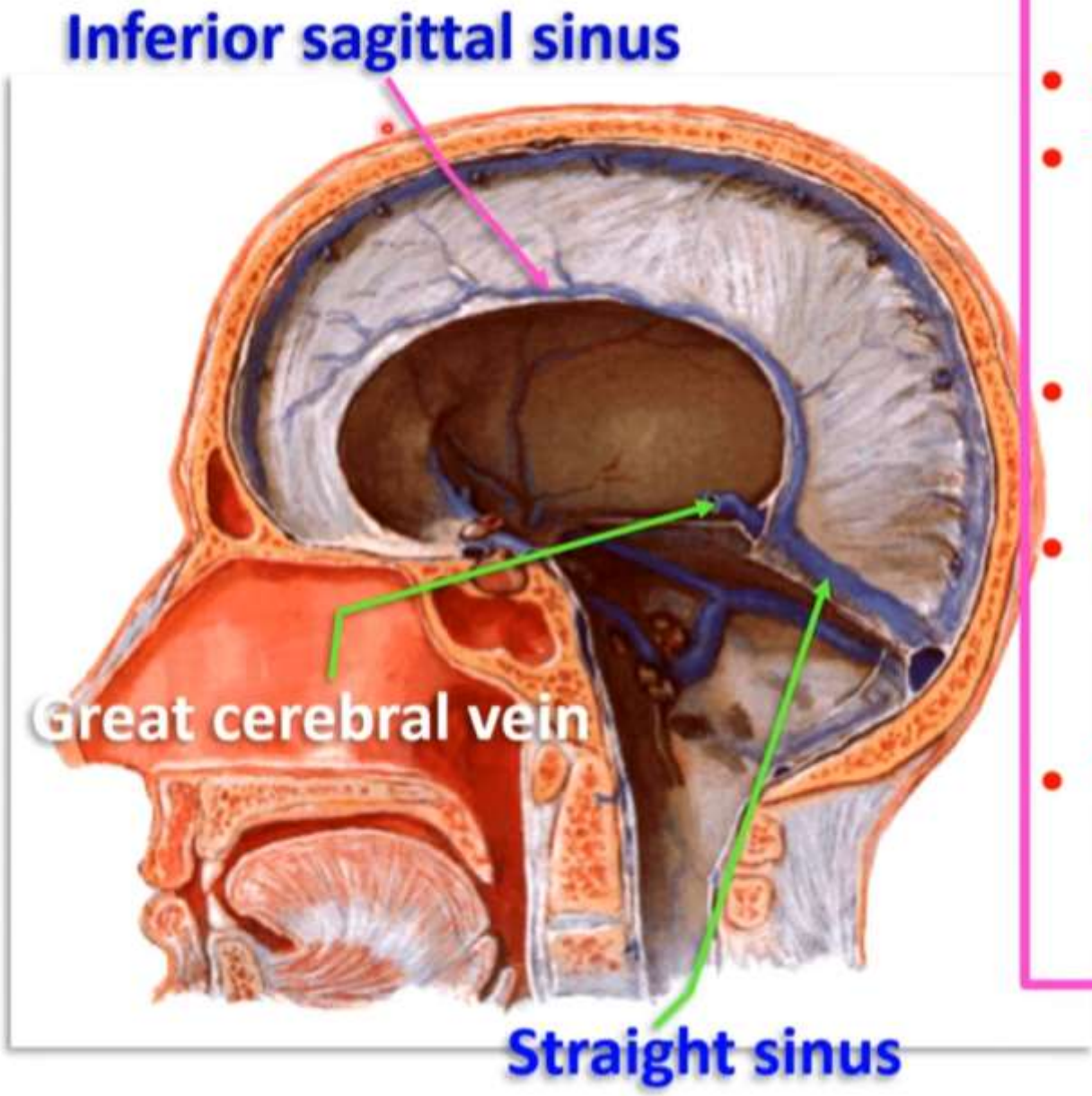


Tributaries of SSS







- **Inferior sagittal sinus**

- **Site**: lies in lower border of falx cerebri.
- **Termination**: it unites with the great cerebral vein to form the **straight sinus**.

- **Straight sinus**

- **Beginning**: is formed by union of inferior sagittal sinus and great cerebral vein.
- **Course**: it runs backwards along the line of attachment of the falx cerebri to the tentorium cerebelli.
- **Termination**: it ends at the internal occipital protuberance by turning to the left to become **left transverse sinus**

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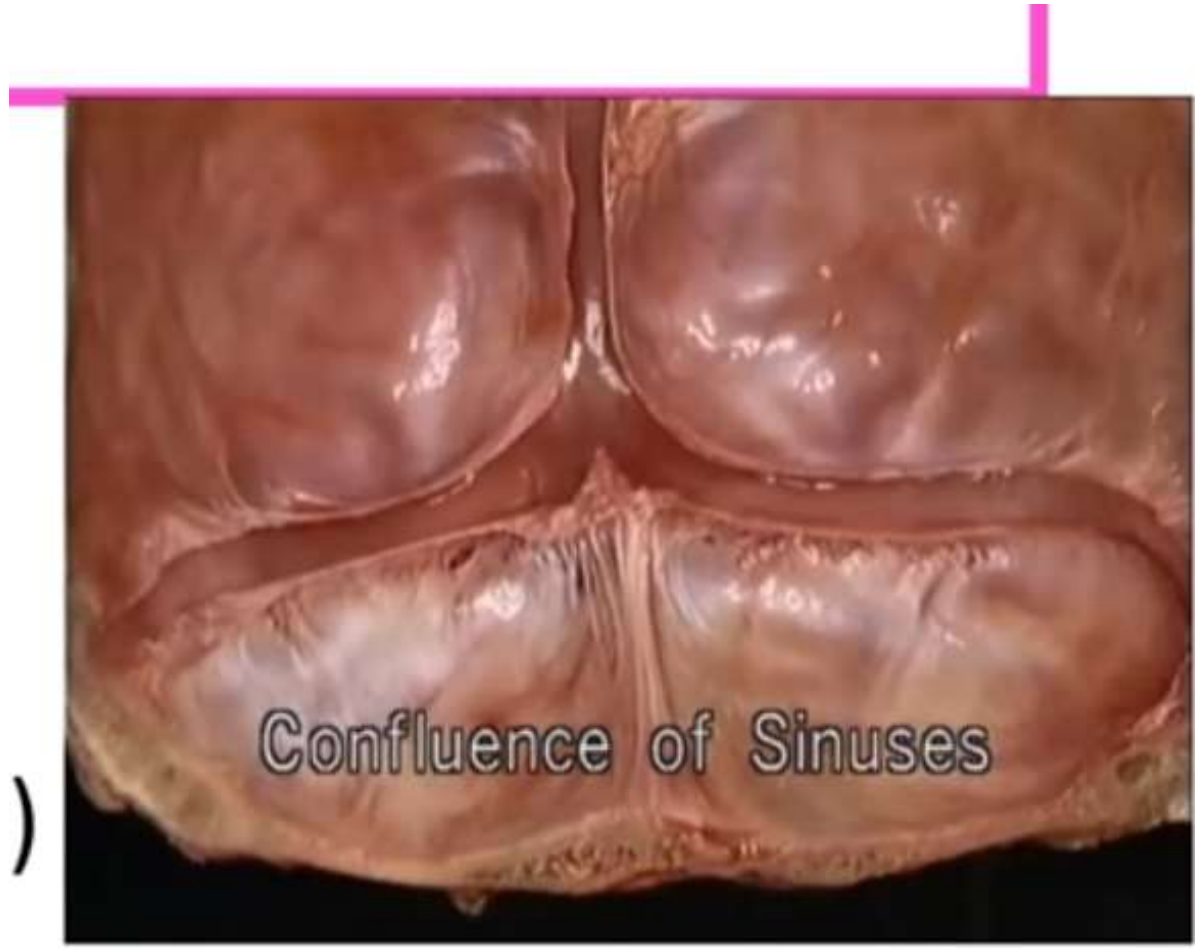
Confluence of Sinuses

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Sphenoparietal sinus
On the lesser wing of the sphenoid sinus

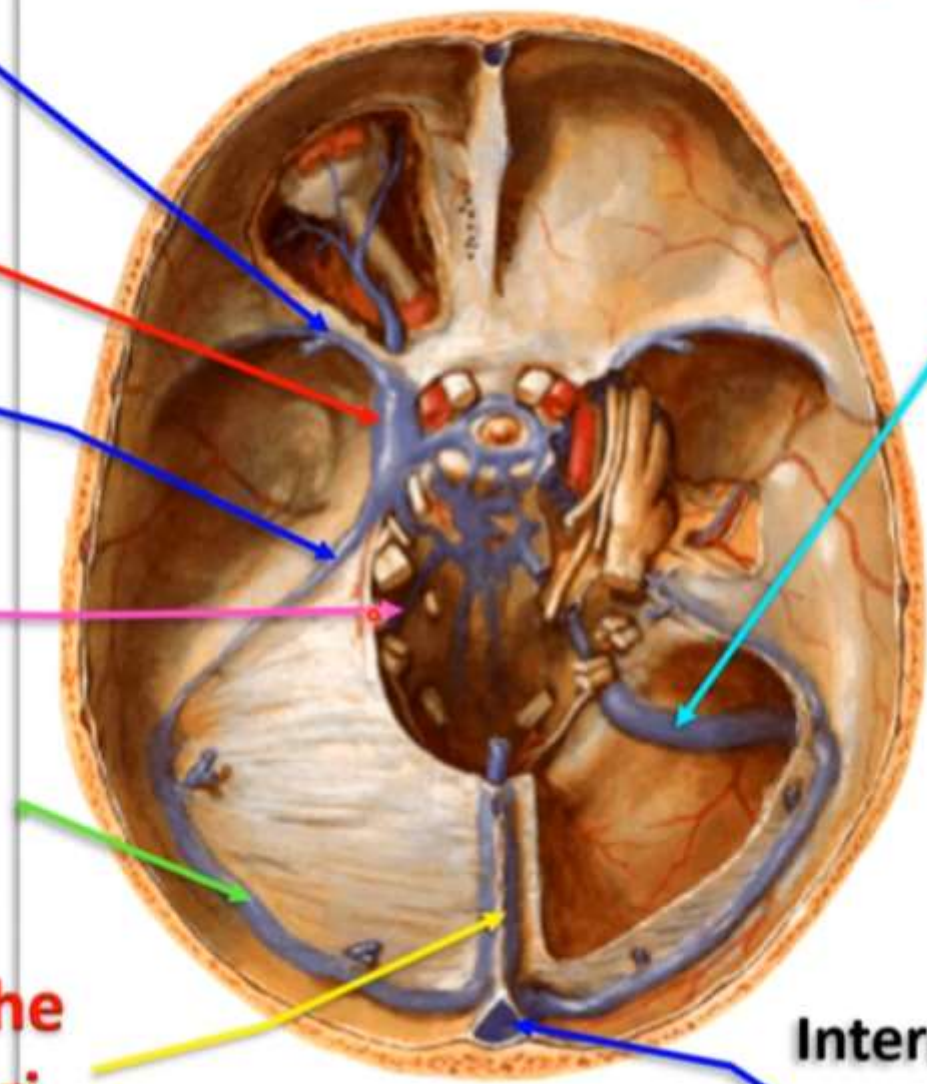
Cavernous sinus

Superior petrosal sinus

Inferior petrosal sinus

Transverse sinus

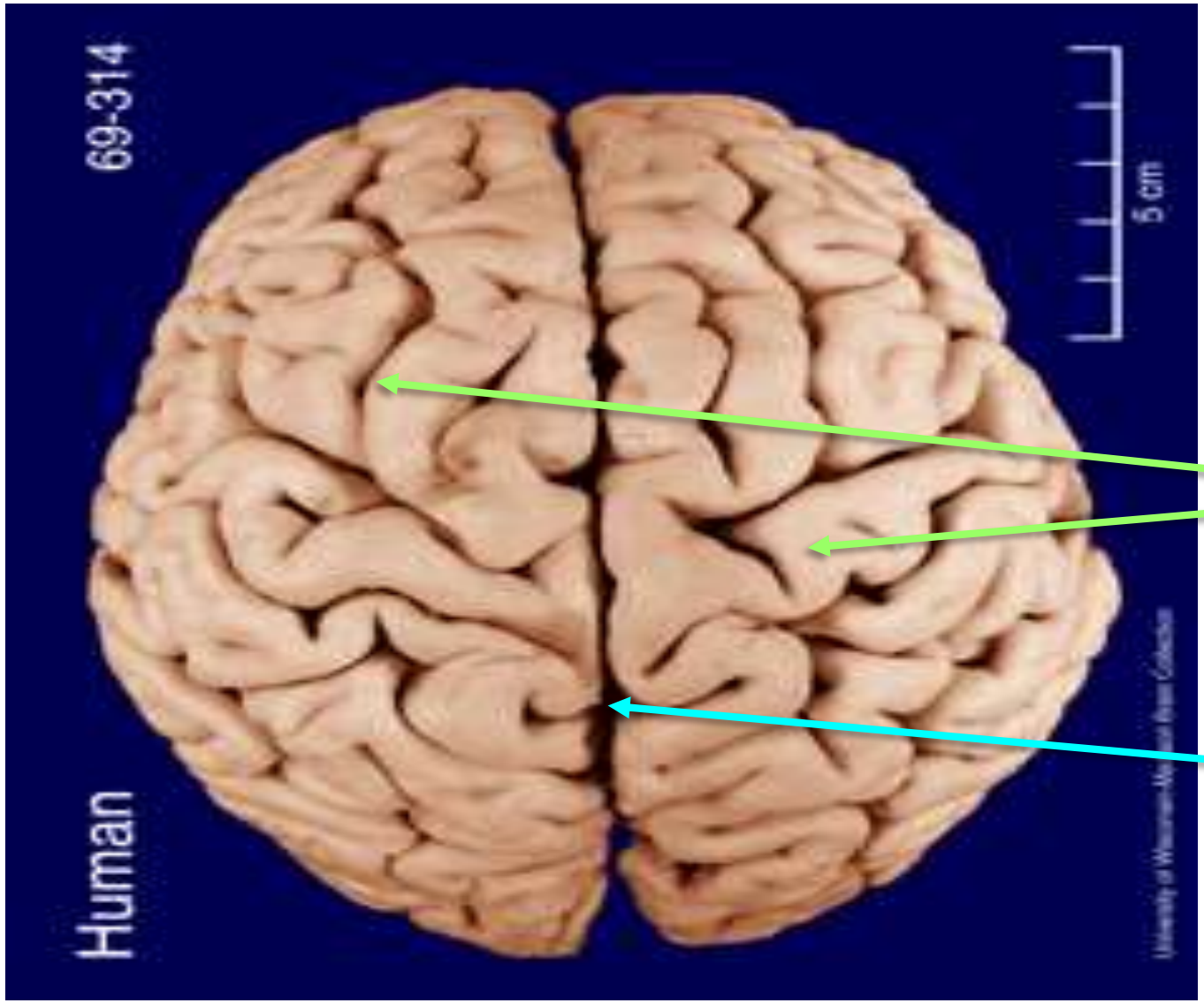
Straight sinus on the base of falx cerebri



Sigmoid sinus

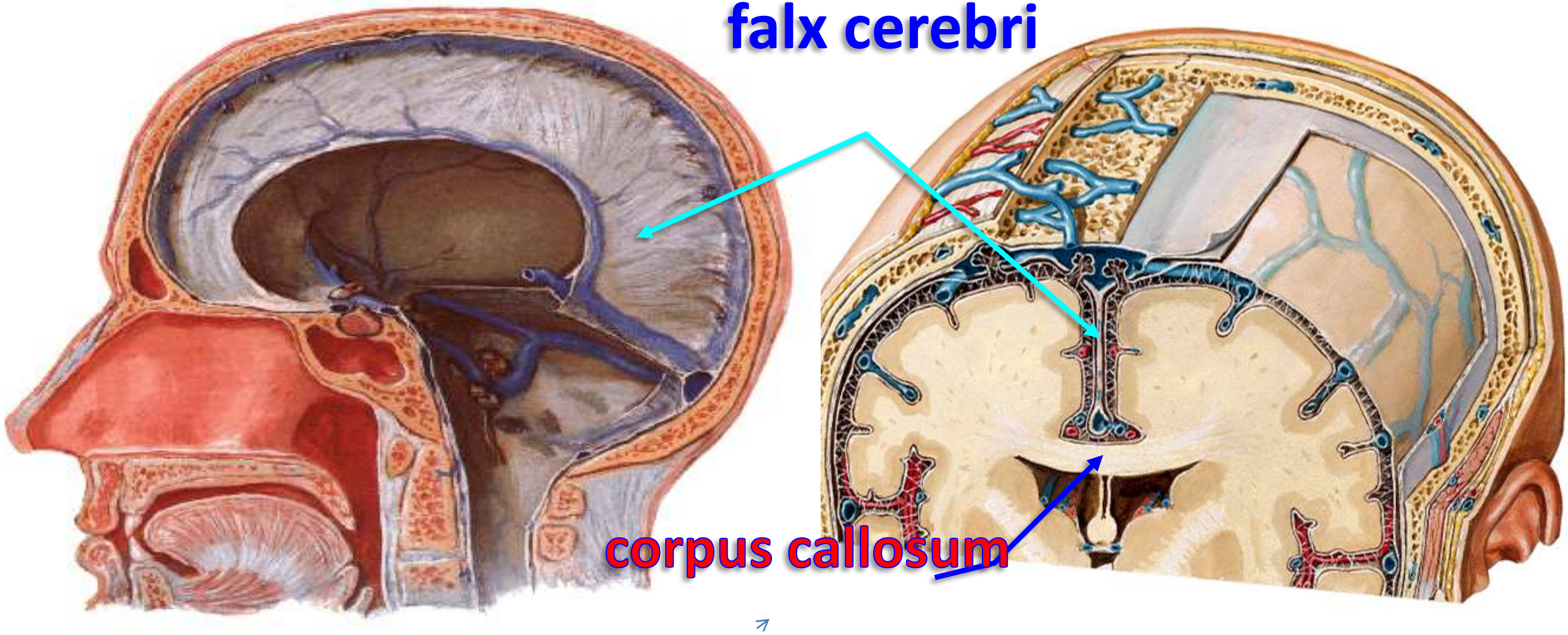
Superior sagittal sinus

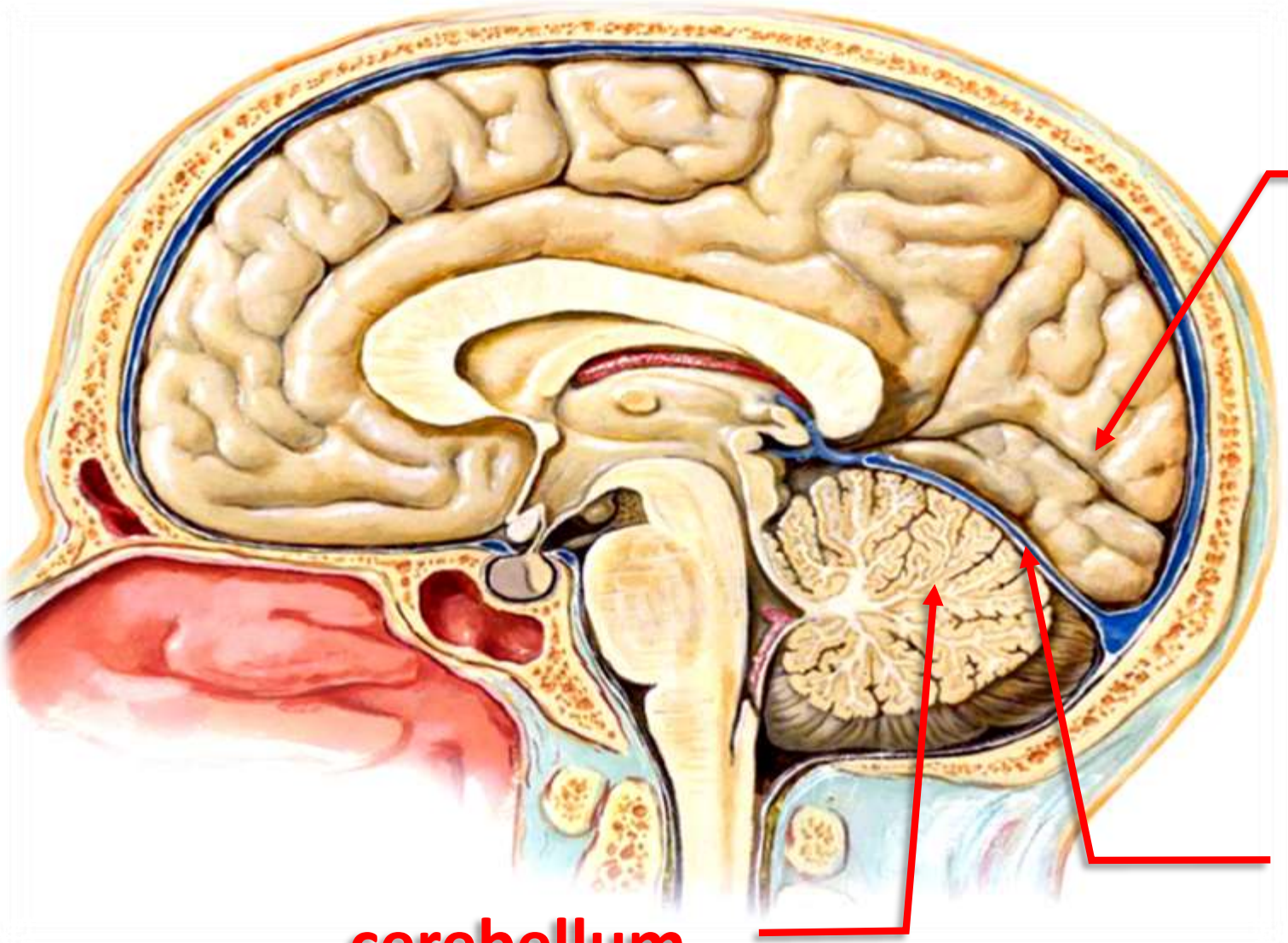
Internal occipital protuberance



2 cerebral hemispheres

longitudinal fissure


falx cerebri
corpus callosum

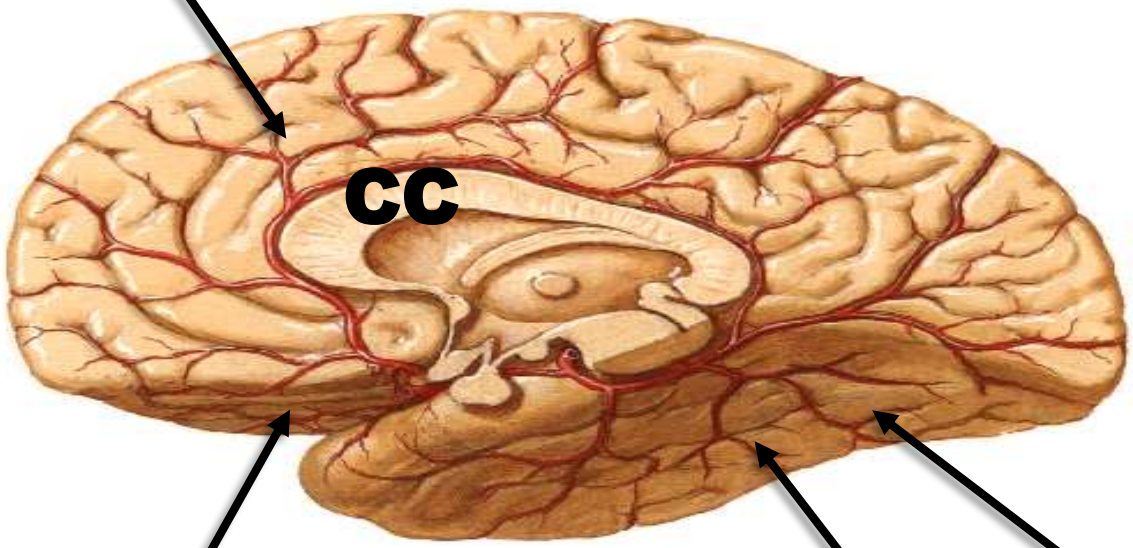


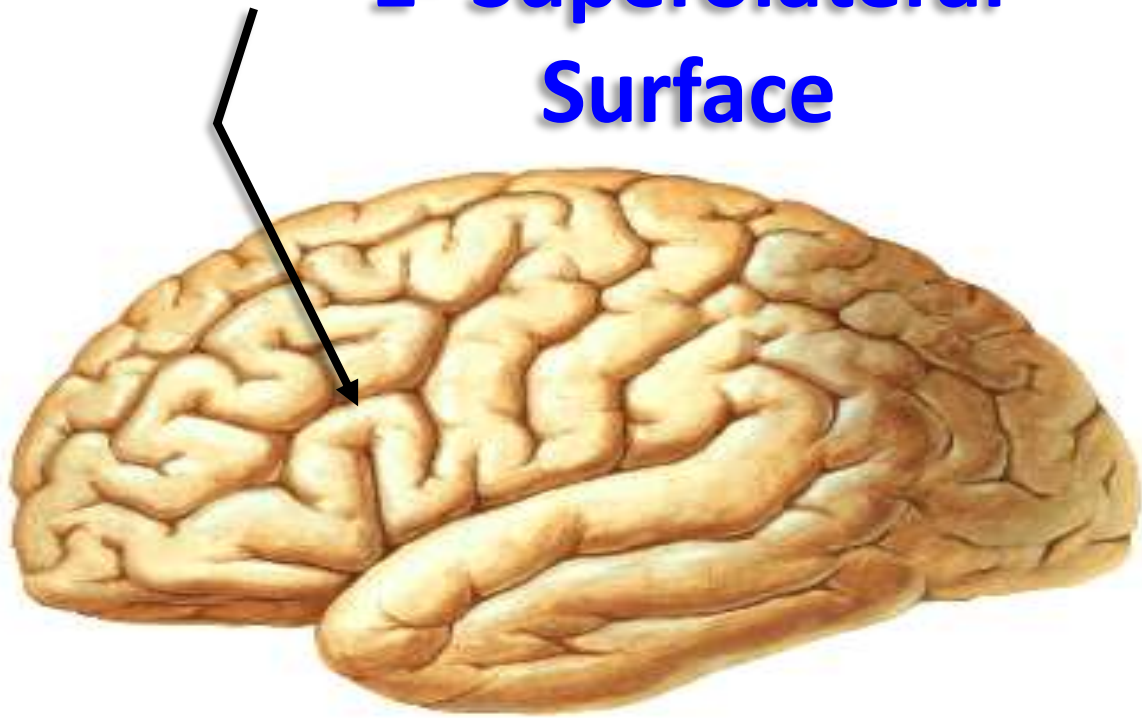
Cerebral hemisphere

Posteriorly

cerebellum

Tentorium cerebelli (cut)

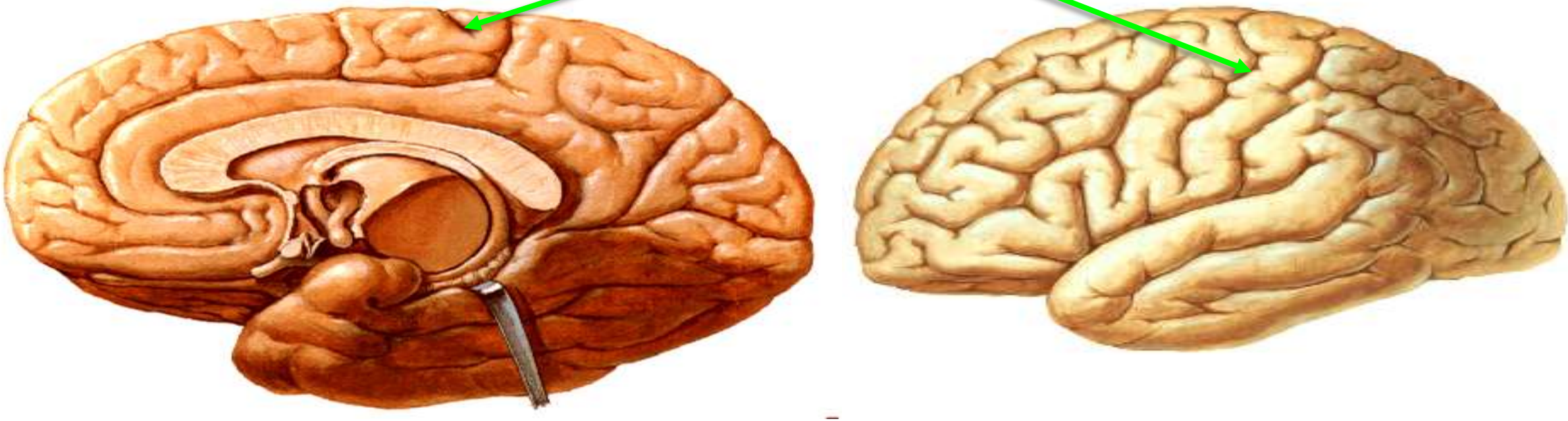




Each cerebral hemisphere has 3 surfaces

Each cerebral hemisphere has 3 poles

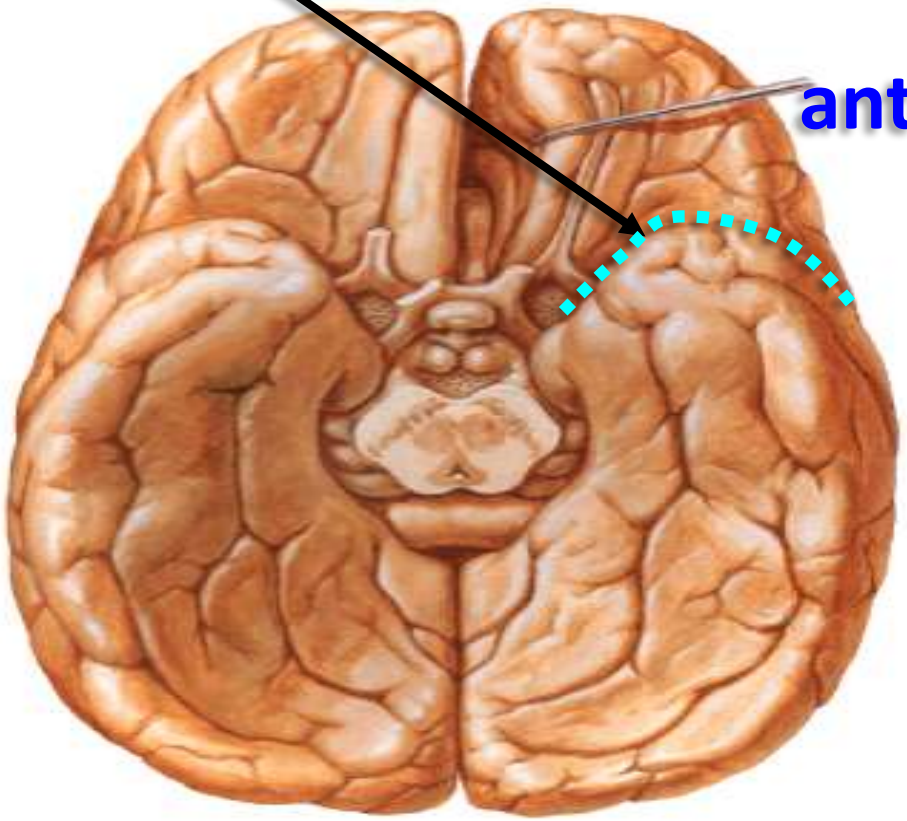
central sulcus

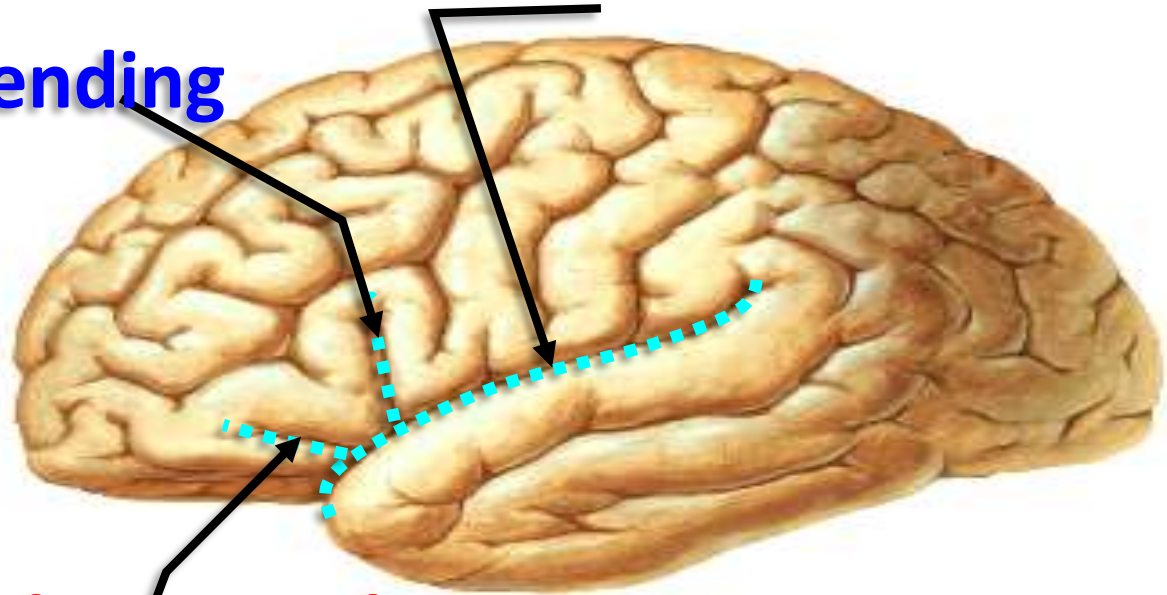


The stem arises on the inferior surface

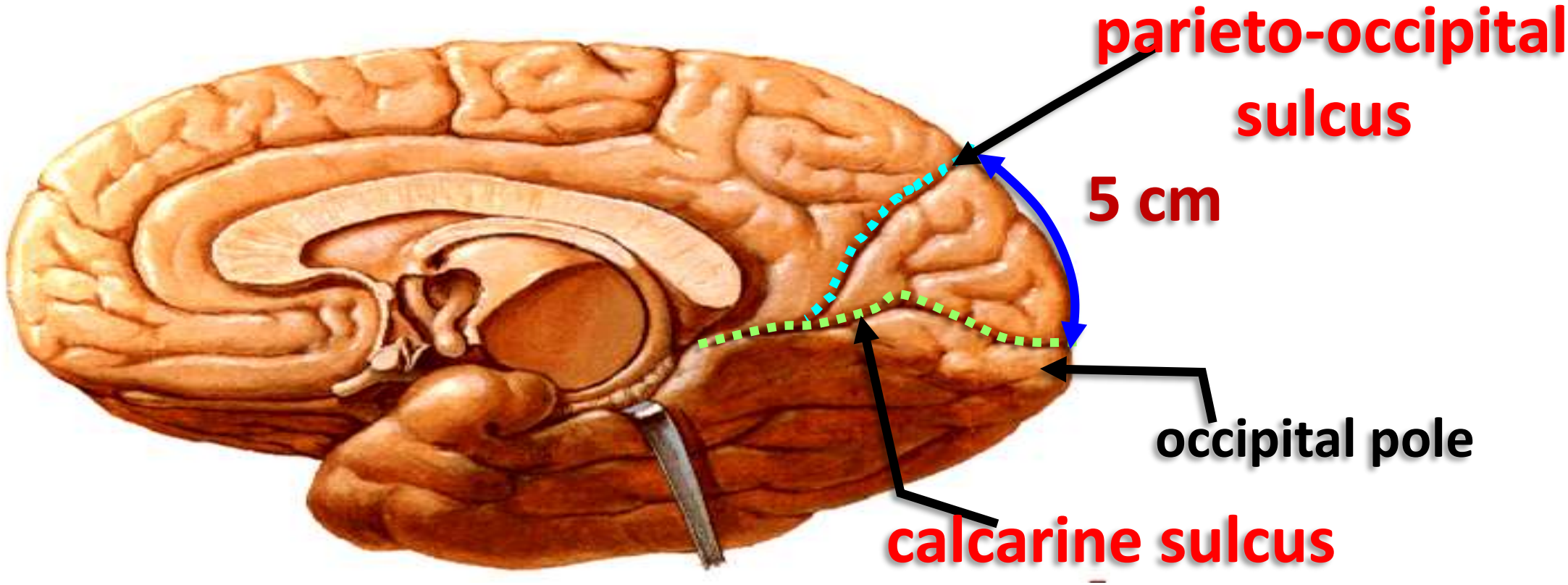
Long posterior ramus

anterior ascending ramus

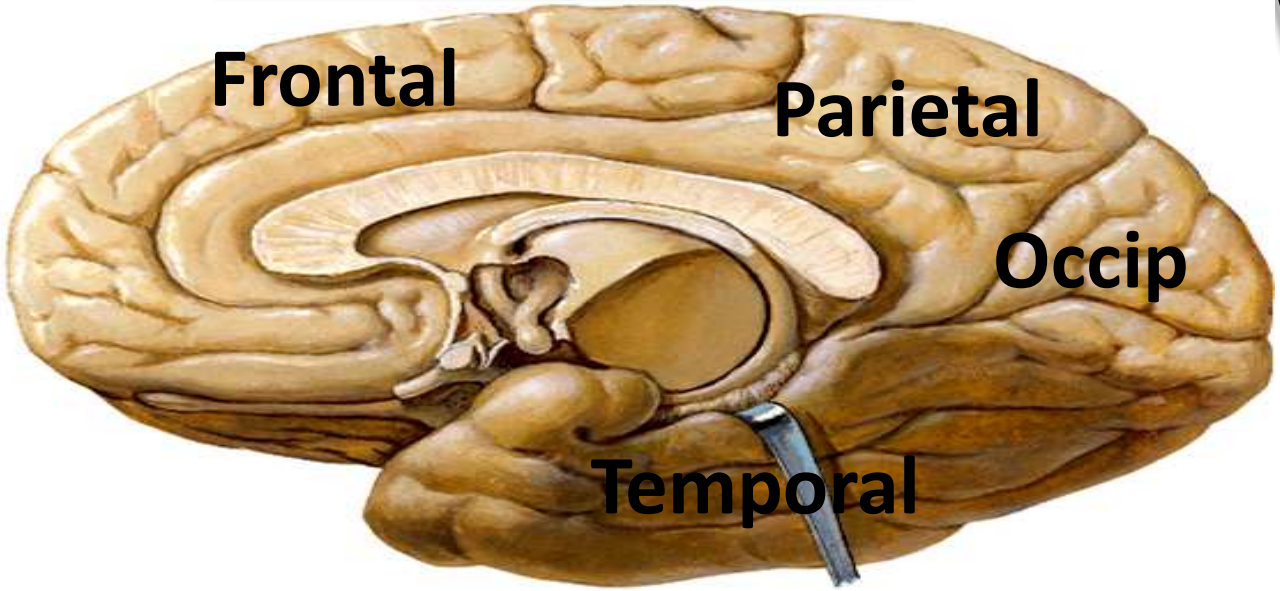


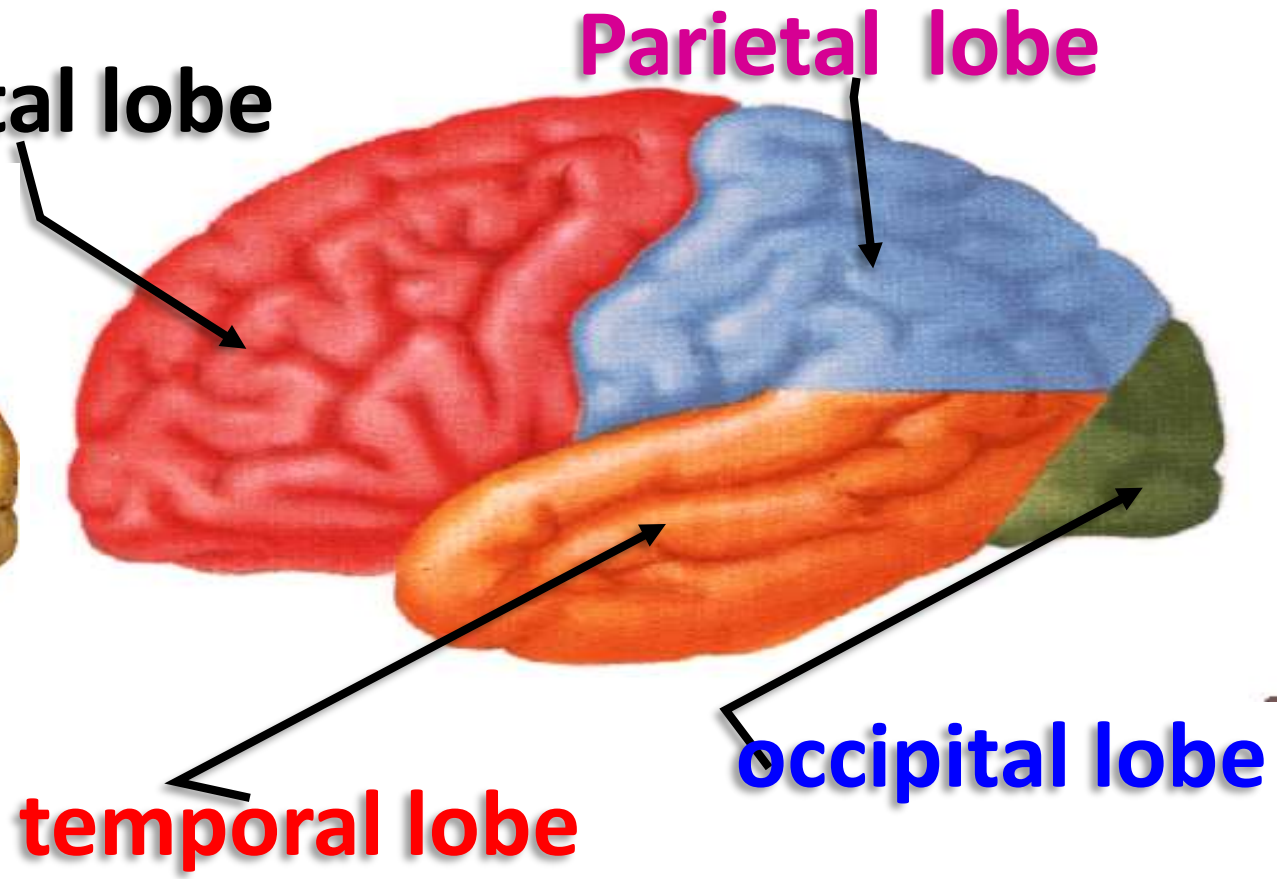


Short horizontal ramus


parieto-occipital sulcus
5 cm
occipital pole
calcarine sulcus

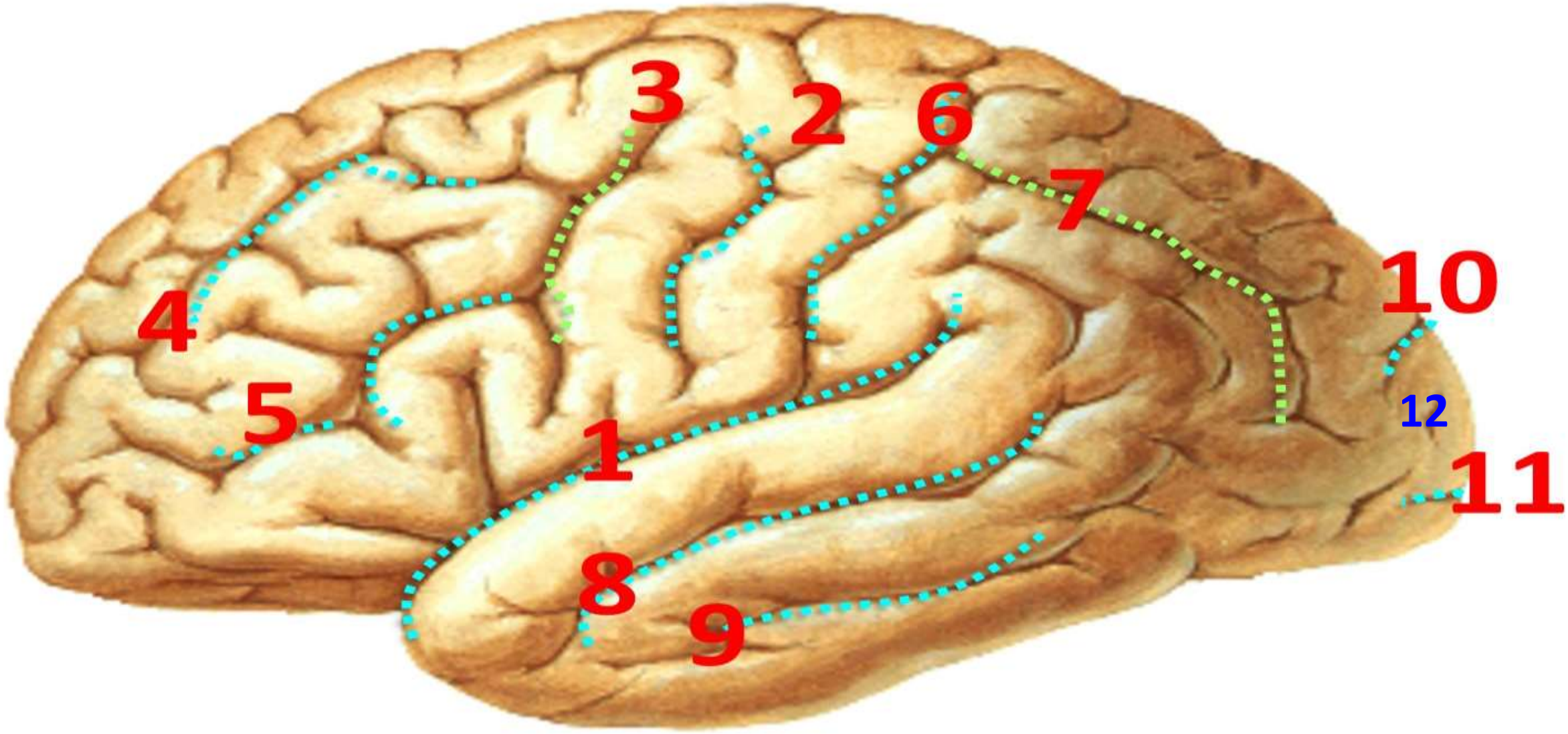
Medial



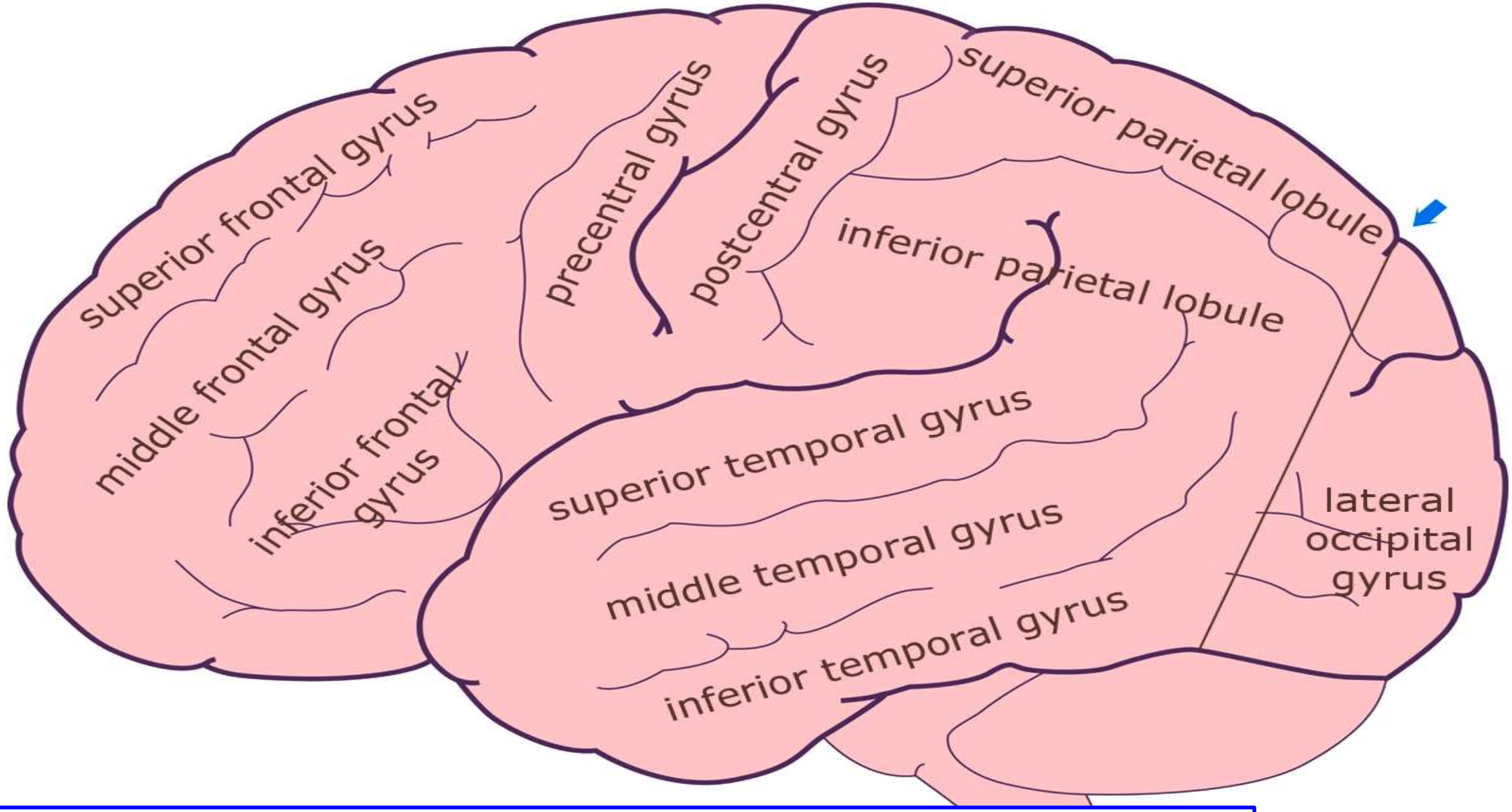


Superolateral

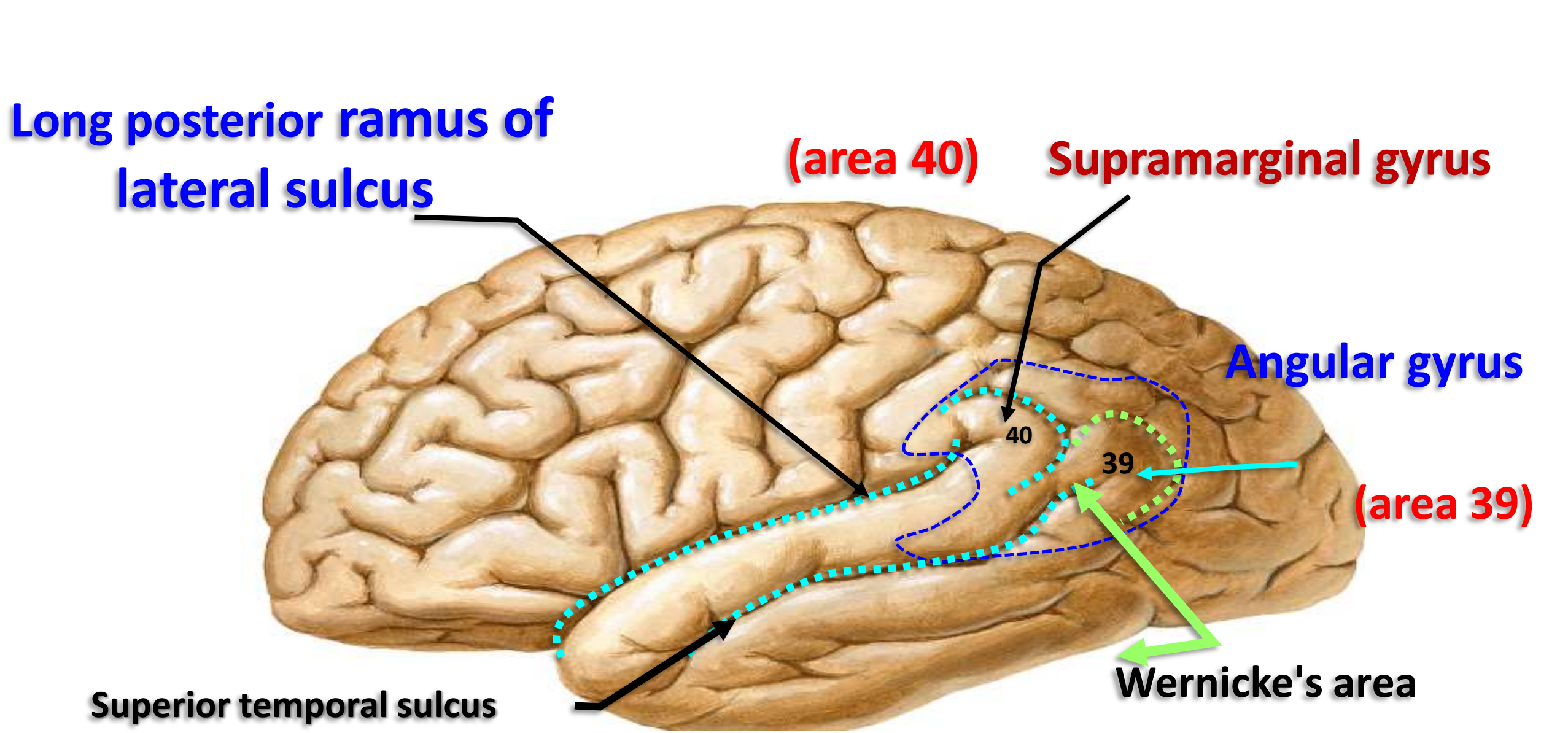
Each cerebral hemisphere has 4 lobes

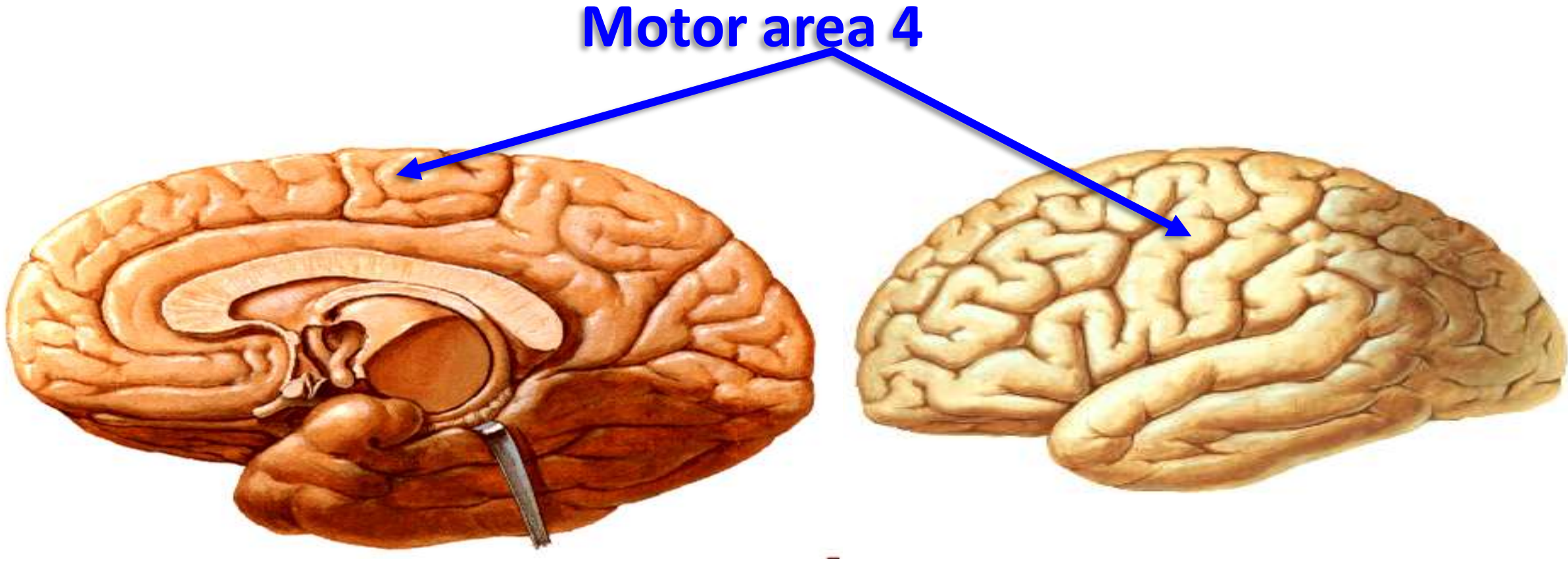


Important Sulci on the supero-lateral surface



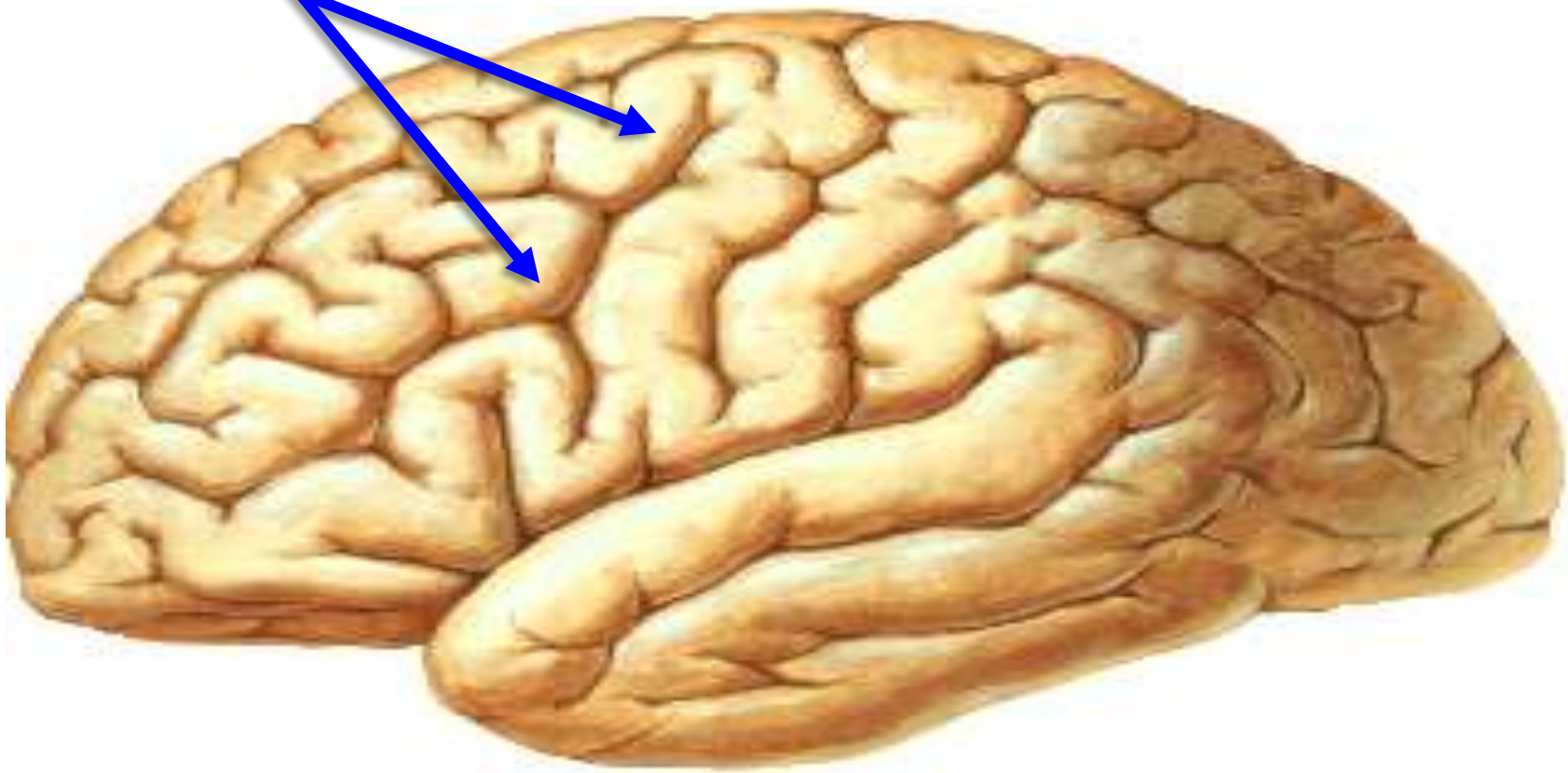
Important gyri on Superolateral Surface


Long posterior ramus of lateral sulcus
(area 40)
Supramarginal gyrus
Angular gyrus
40
39
(area 39)
Wernicke's area
Superior temporal sulcus

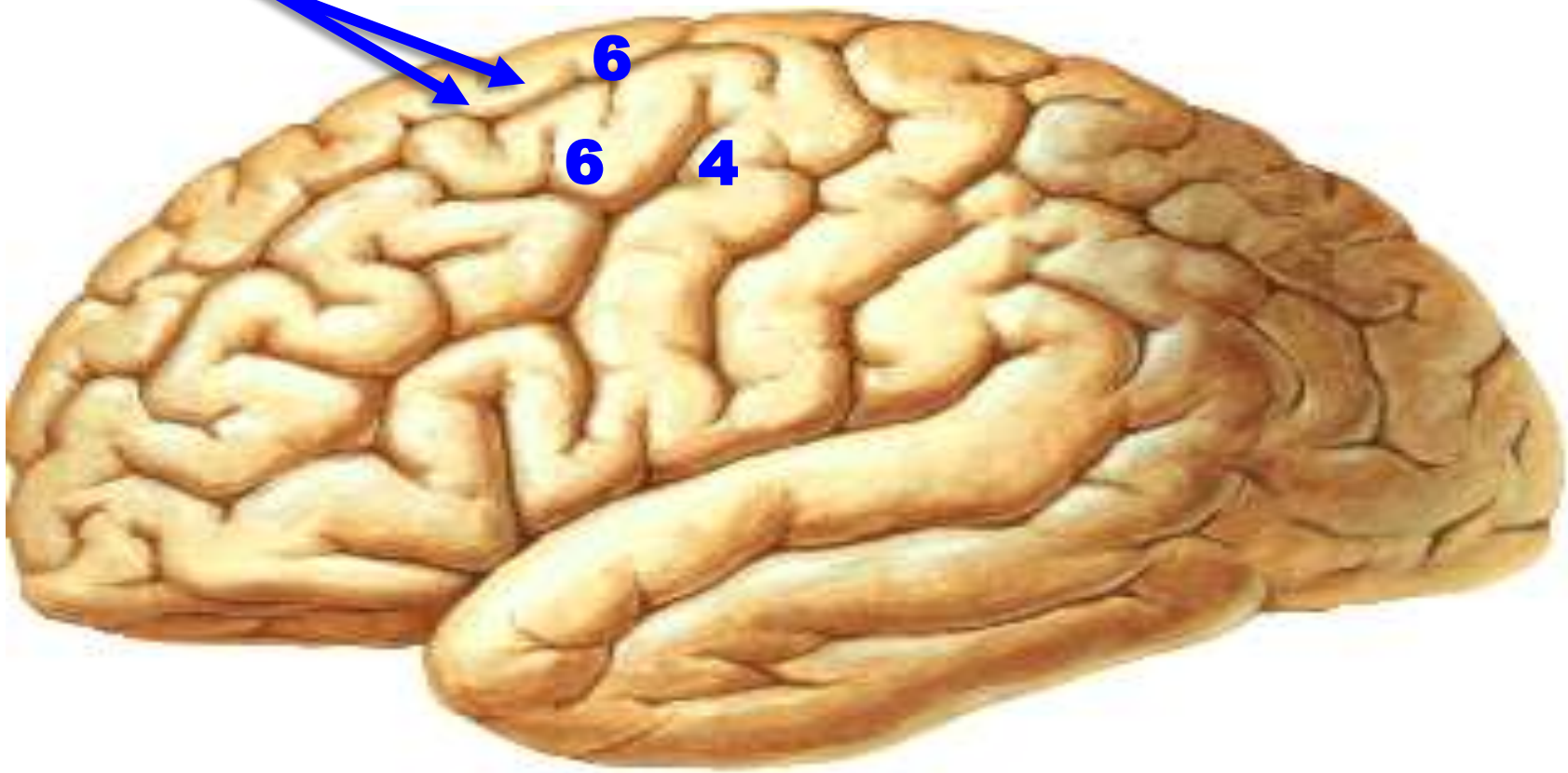


- **Primary motor cortex** corresponds to the precentral gyrus (area 4), anterior part of the paracentral lobule **Controls motor functions**

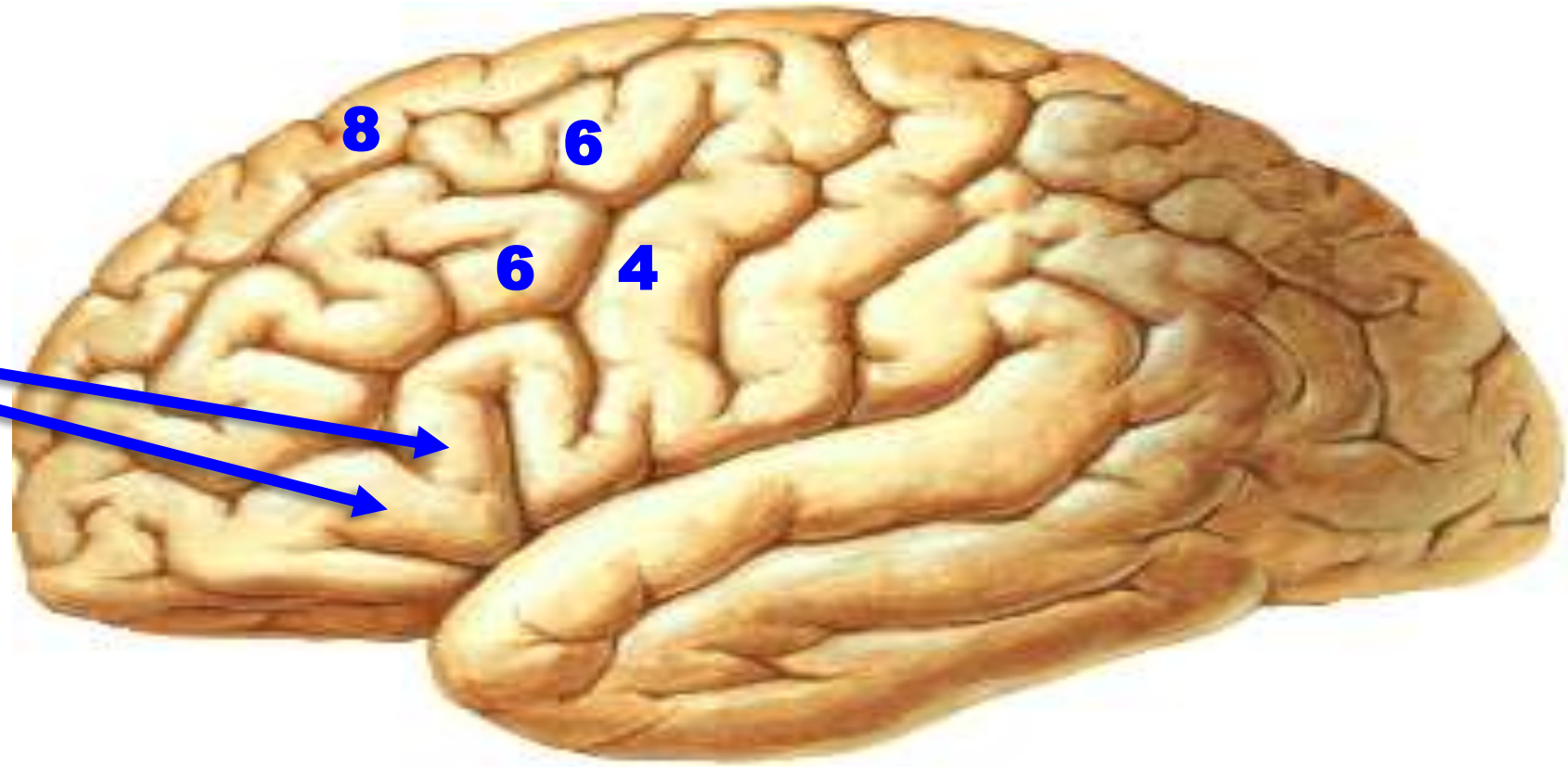
Premotor area 6



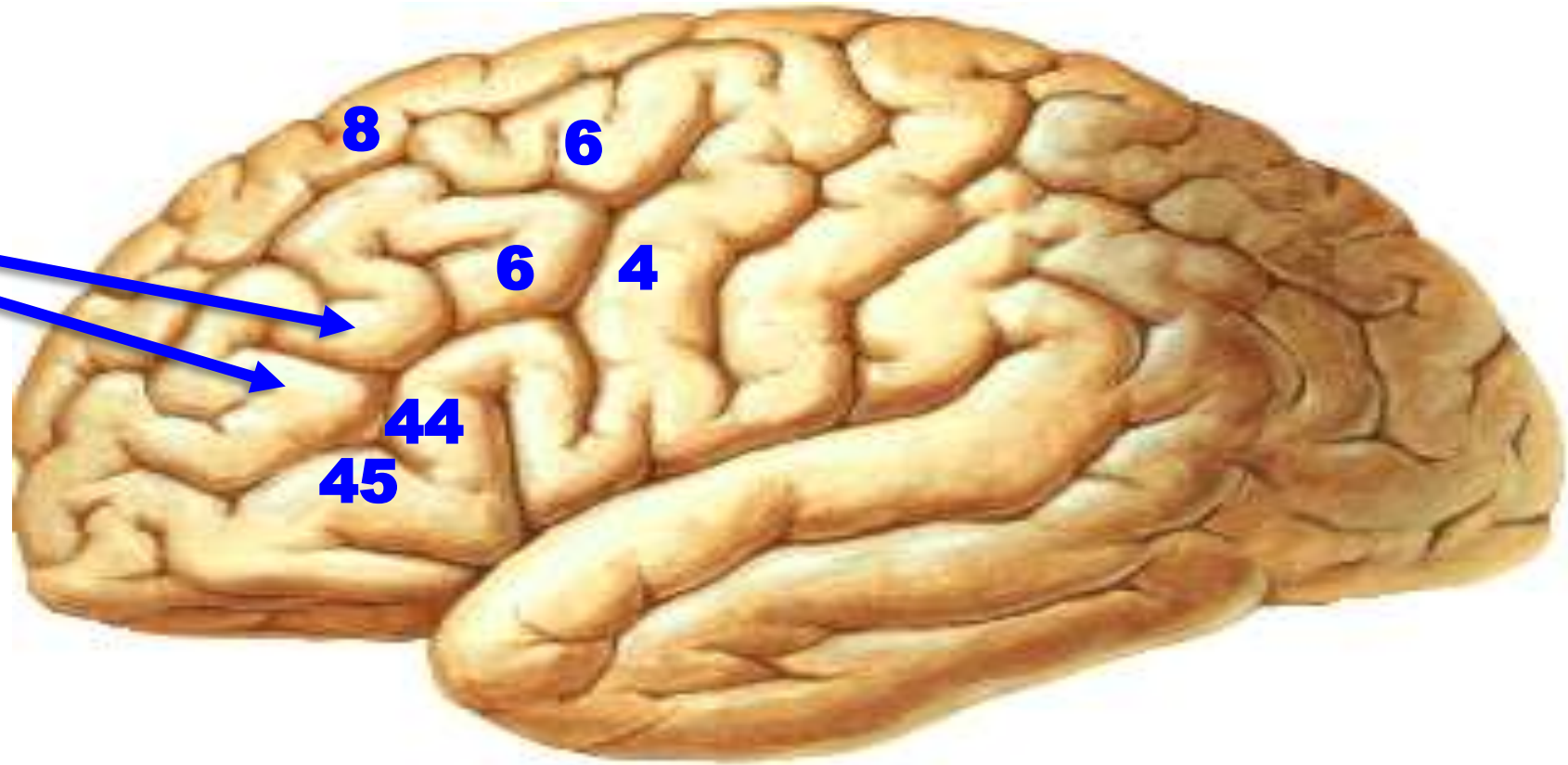
Frontal eye field area 8



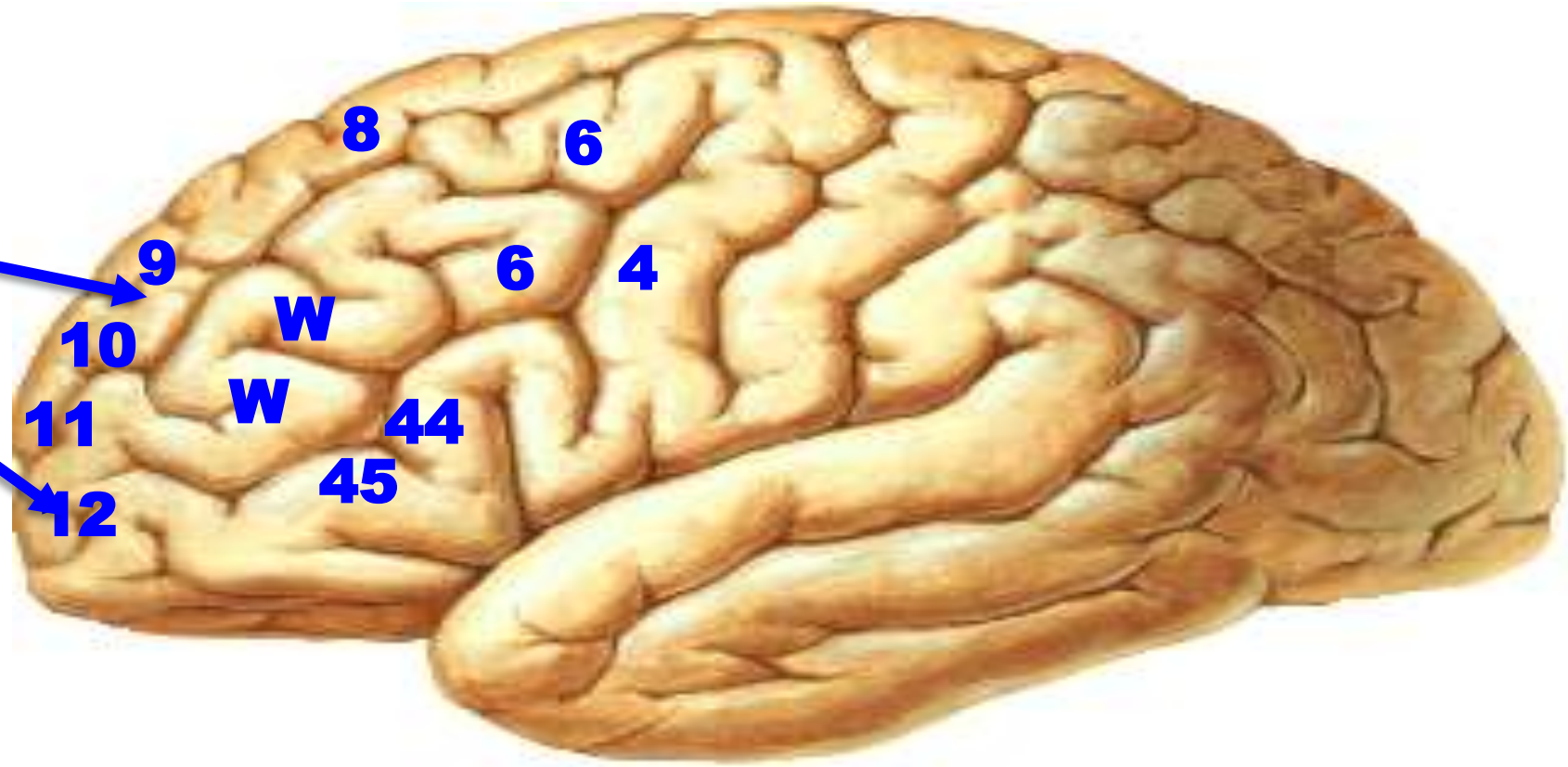
(Broca's area)
44, 45



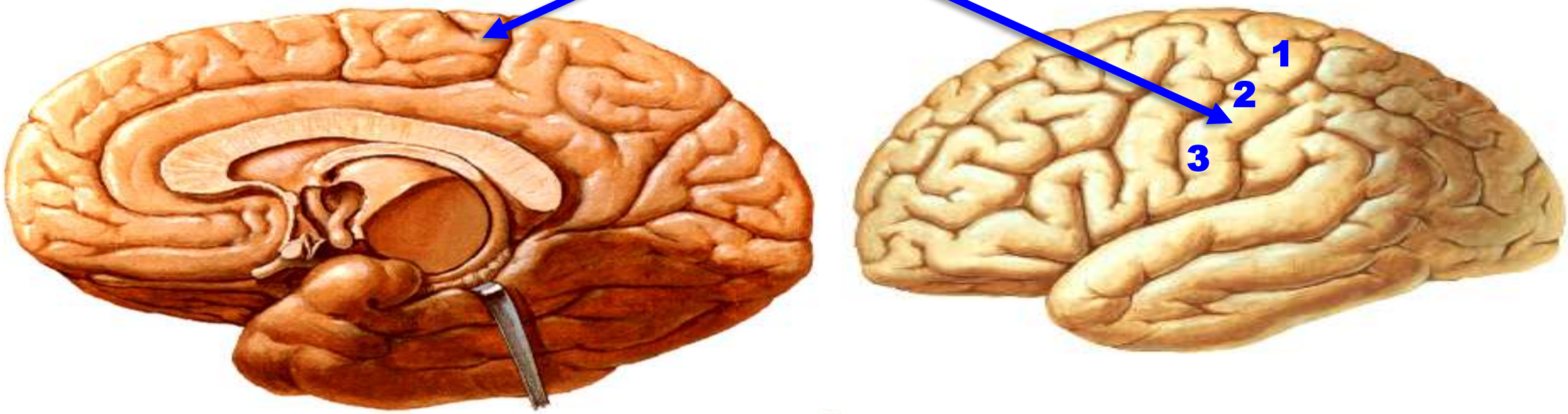
(Writing area)

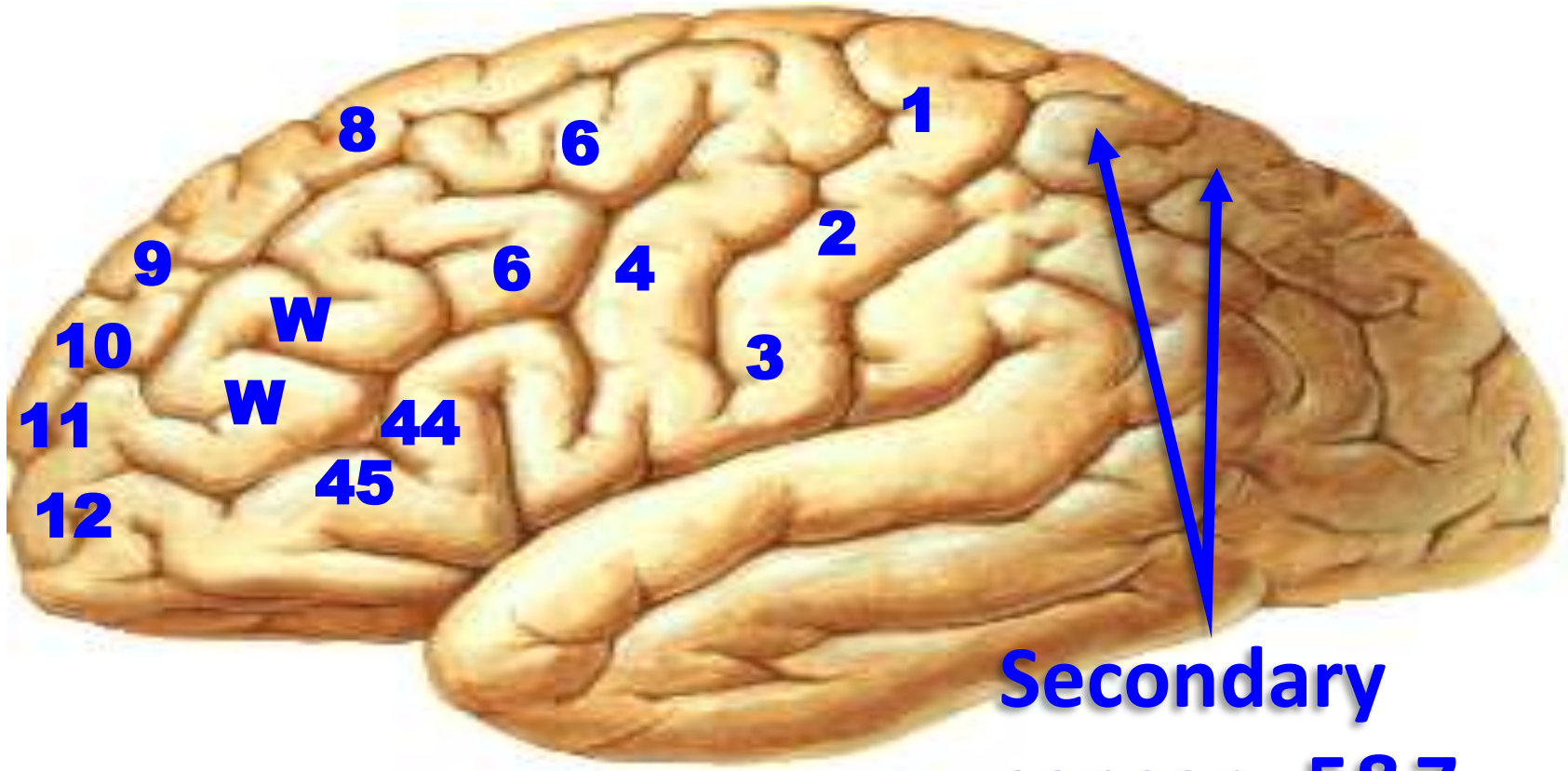


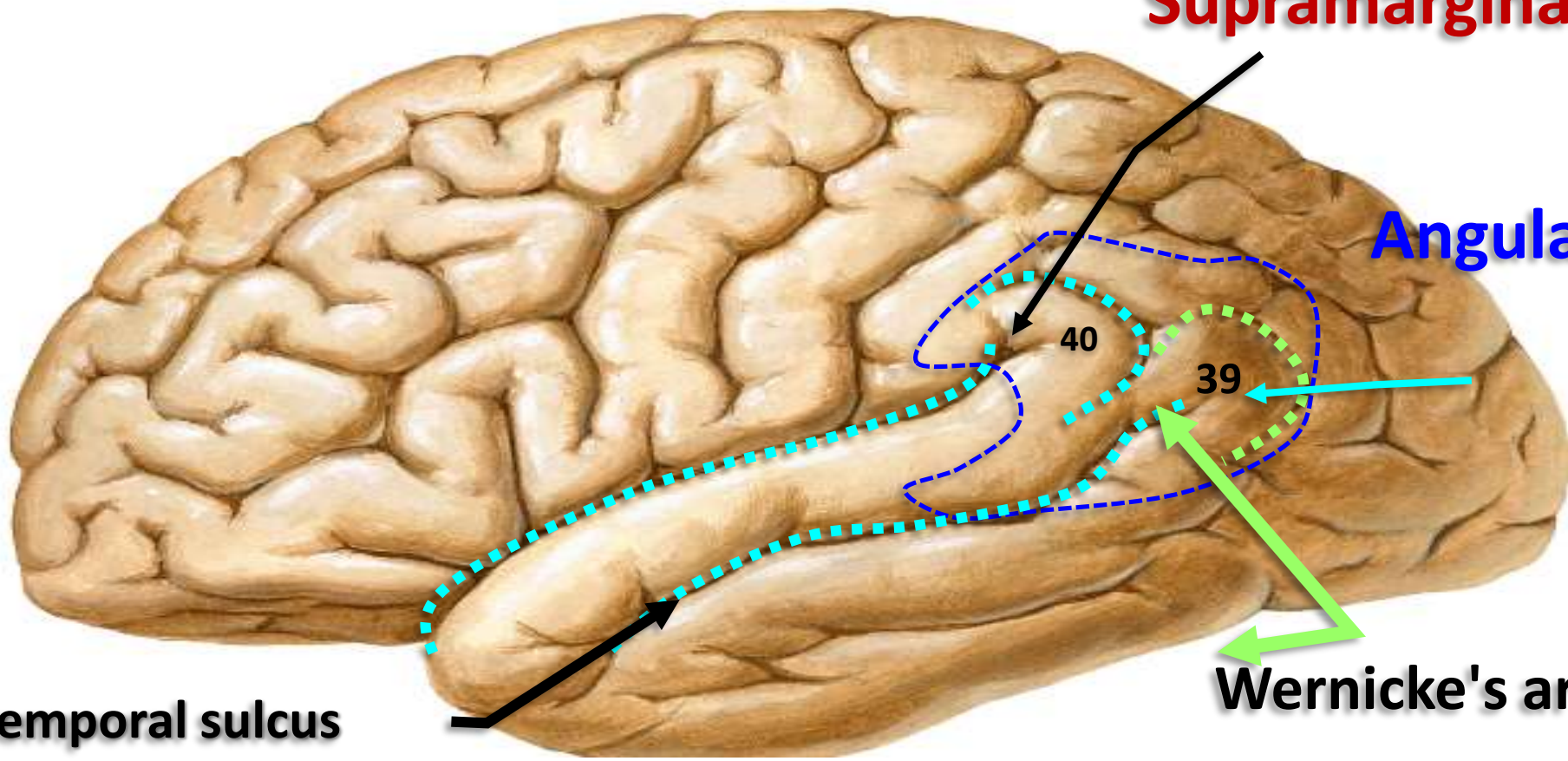
Prefrontal areas

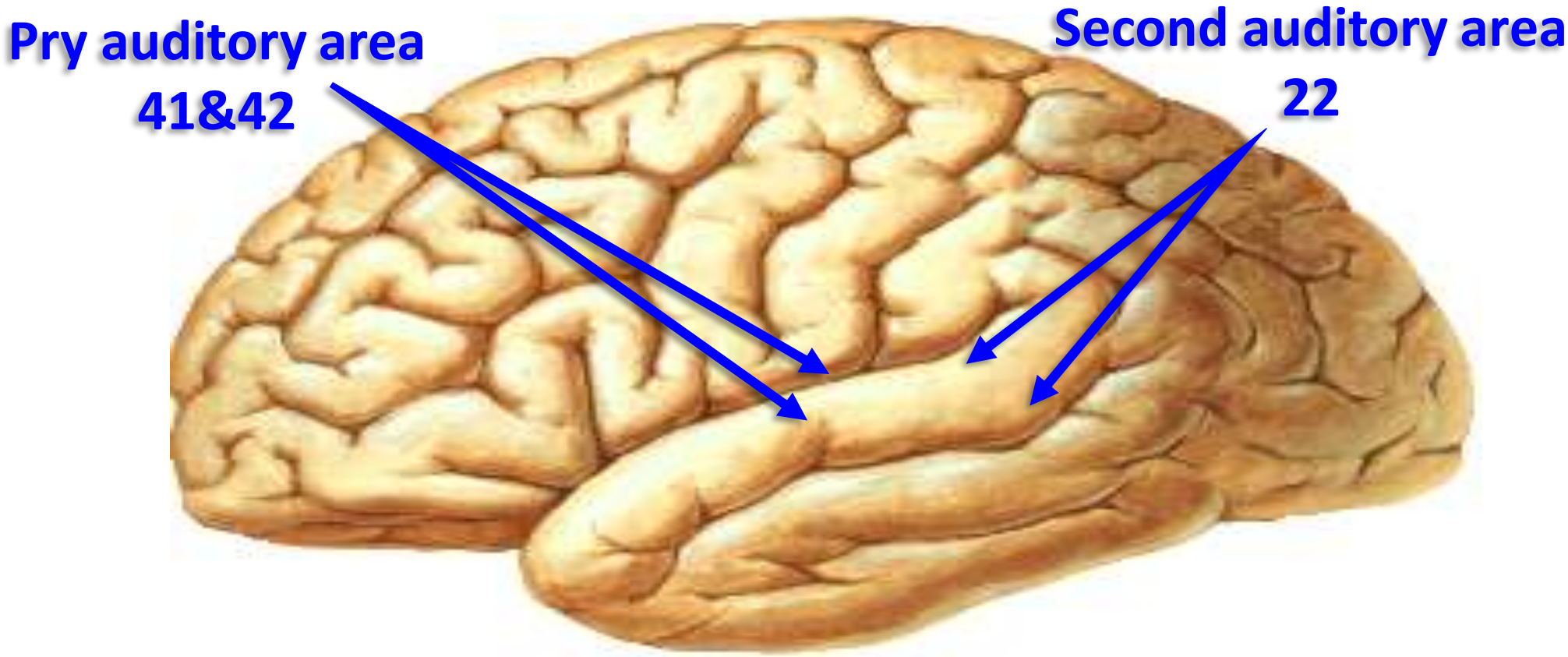


Somatosensory area 1,2,3



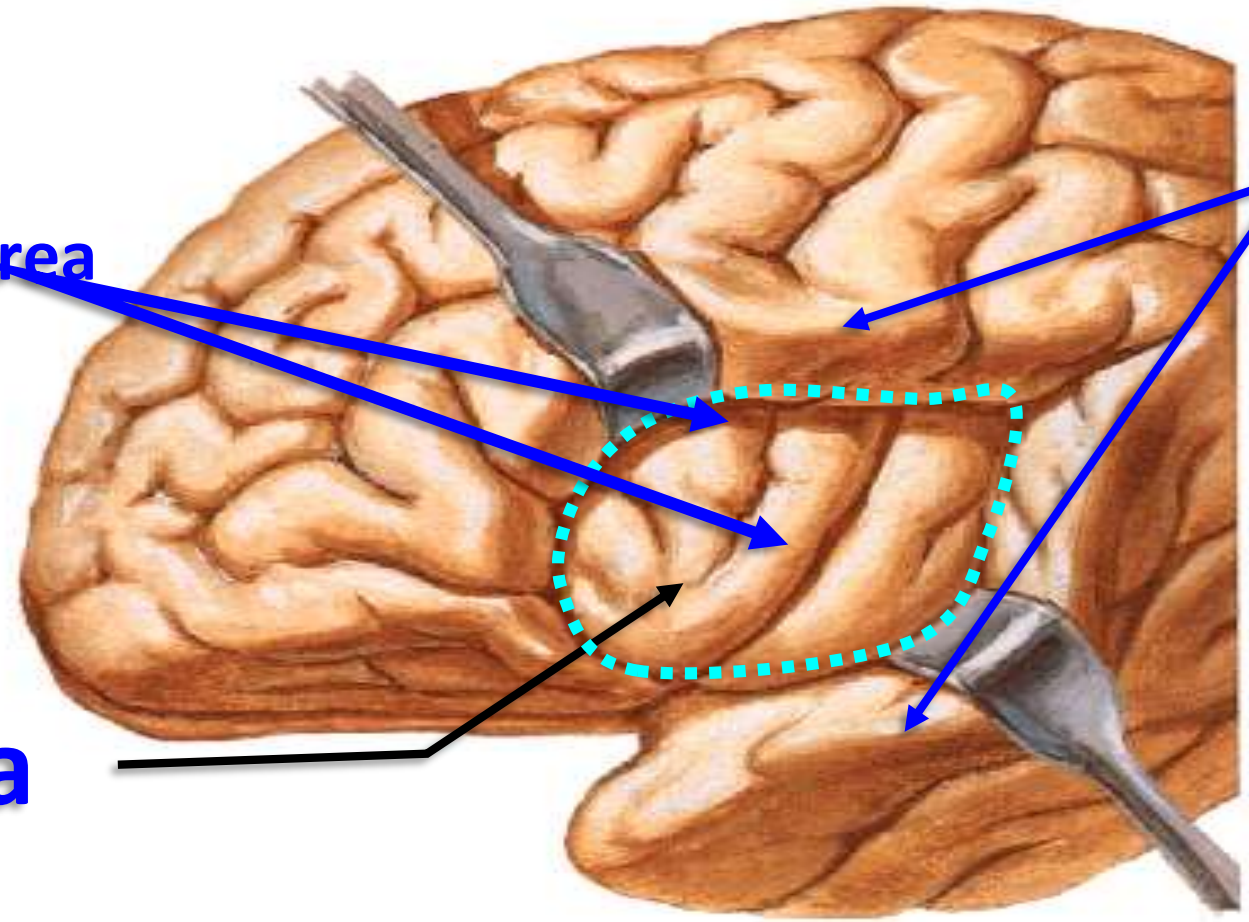

8
6
1
2
9
6
4
W
10
3
W
11
44
45
12
Secondary
sensory 5&7


Supramarginal gyrus
Angular gyrus
40
39
Wernicke's area
Superior temporal sulcus


Pry auditory area
41&42
Second auditory area
22

Gustatory area
43

Insula

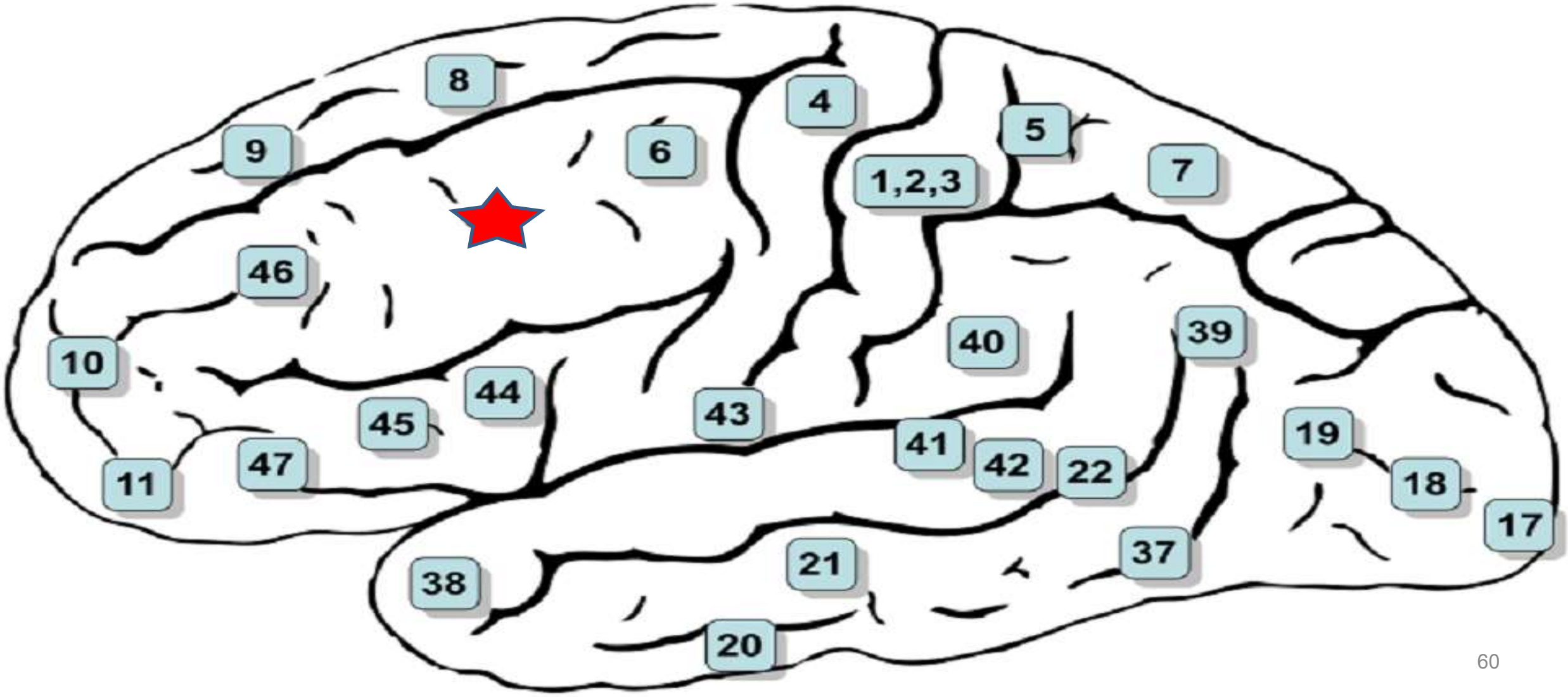


the lips of the lateral sulcus are separated

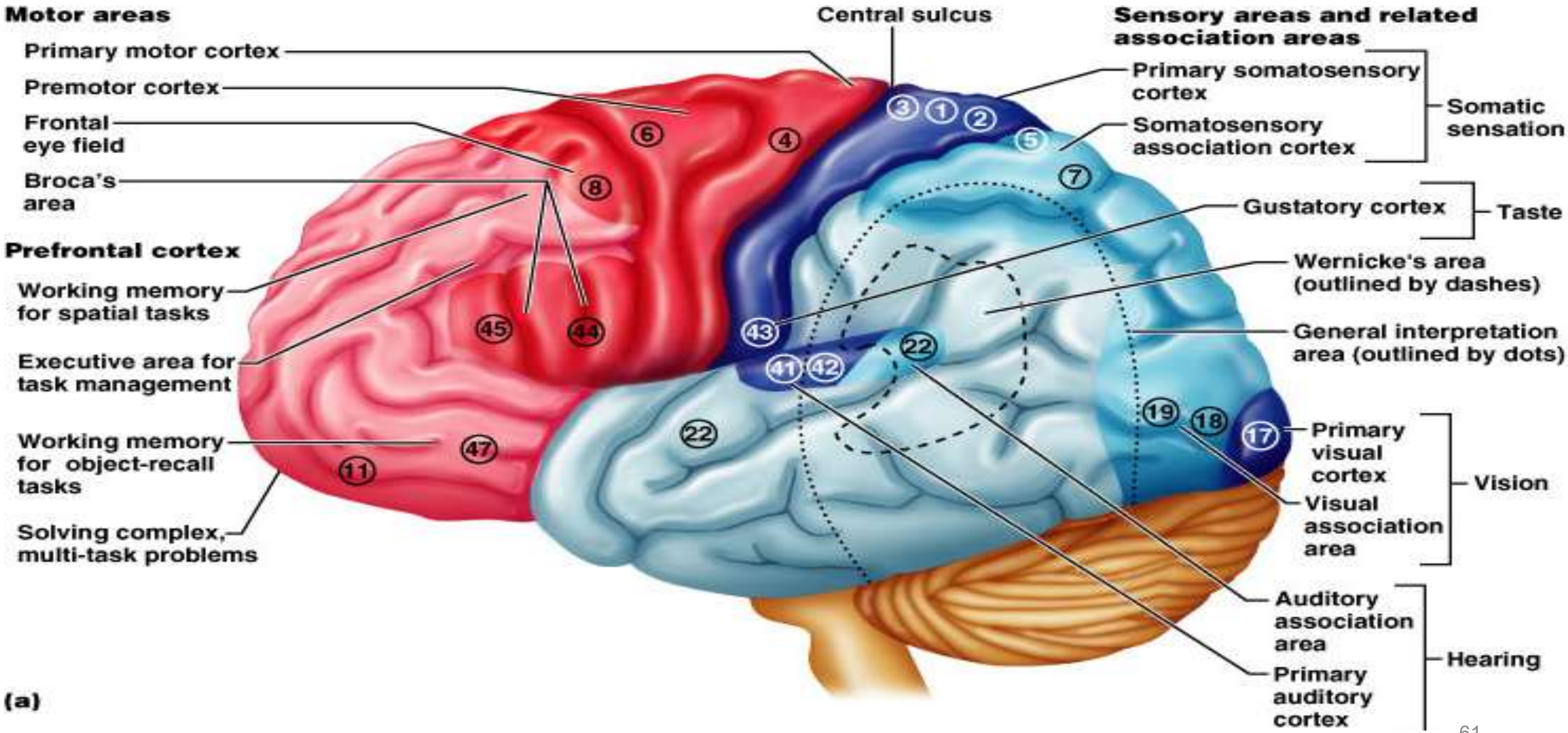
Functional areas of the supero-lateral surface

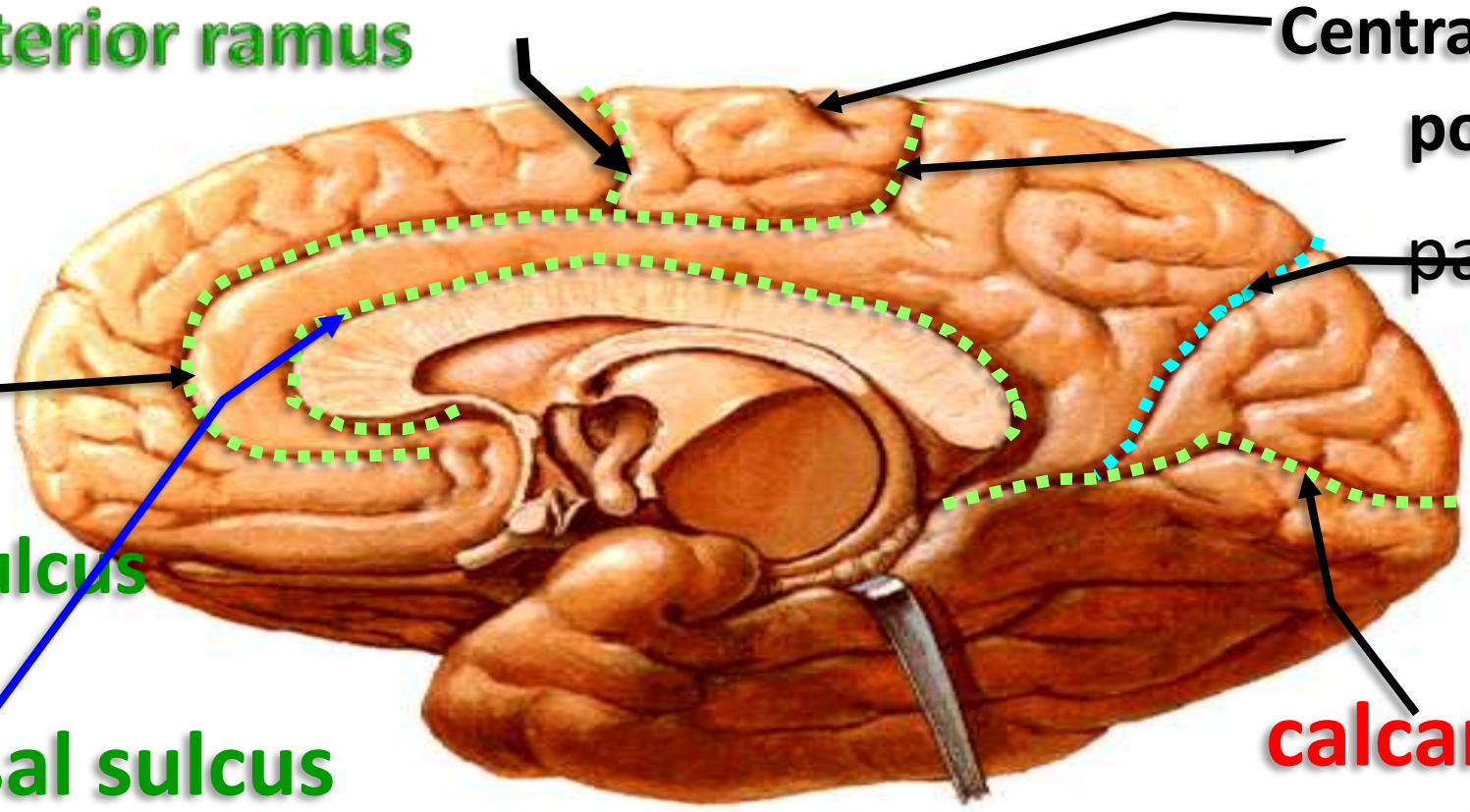
(Brodmann areas in all surfaces)

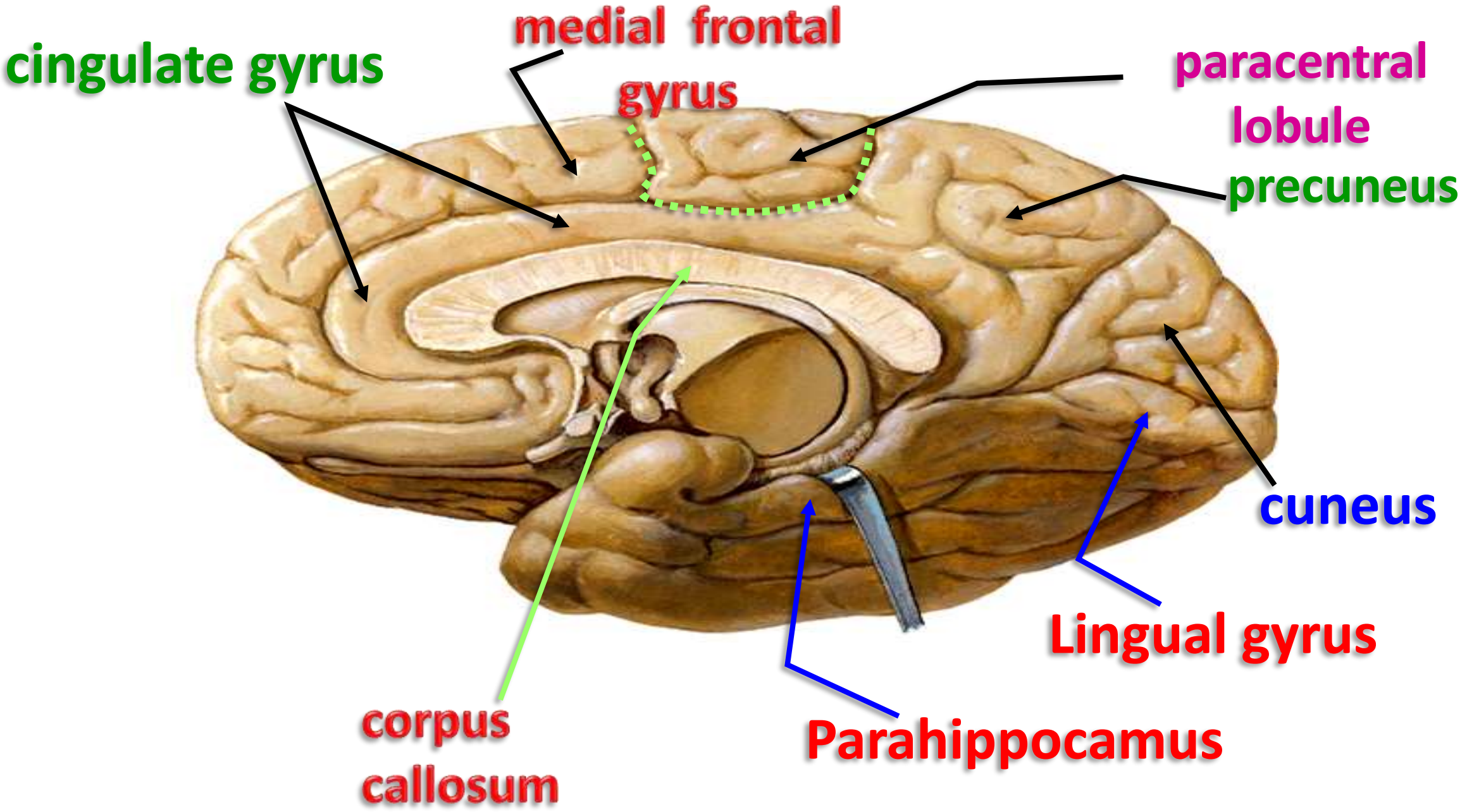
52 structurally distinct areas of cerebral cortex

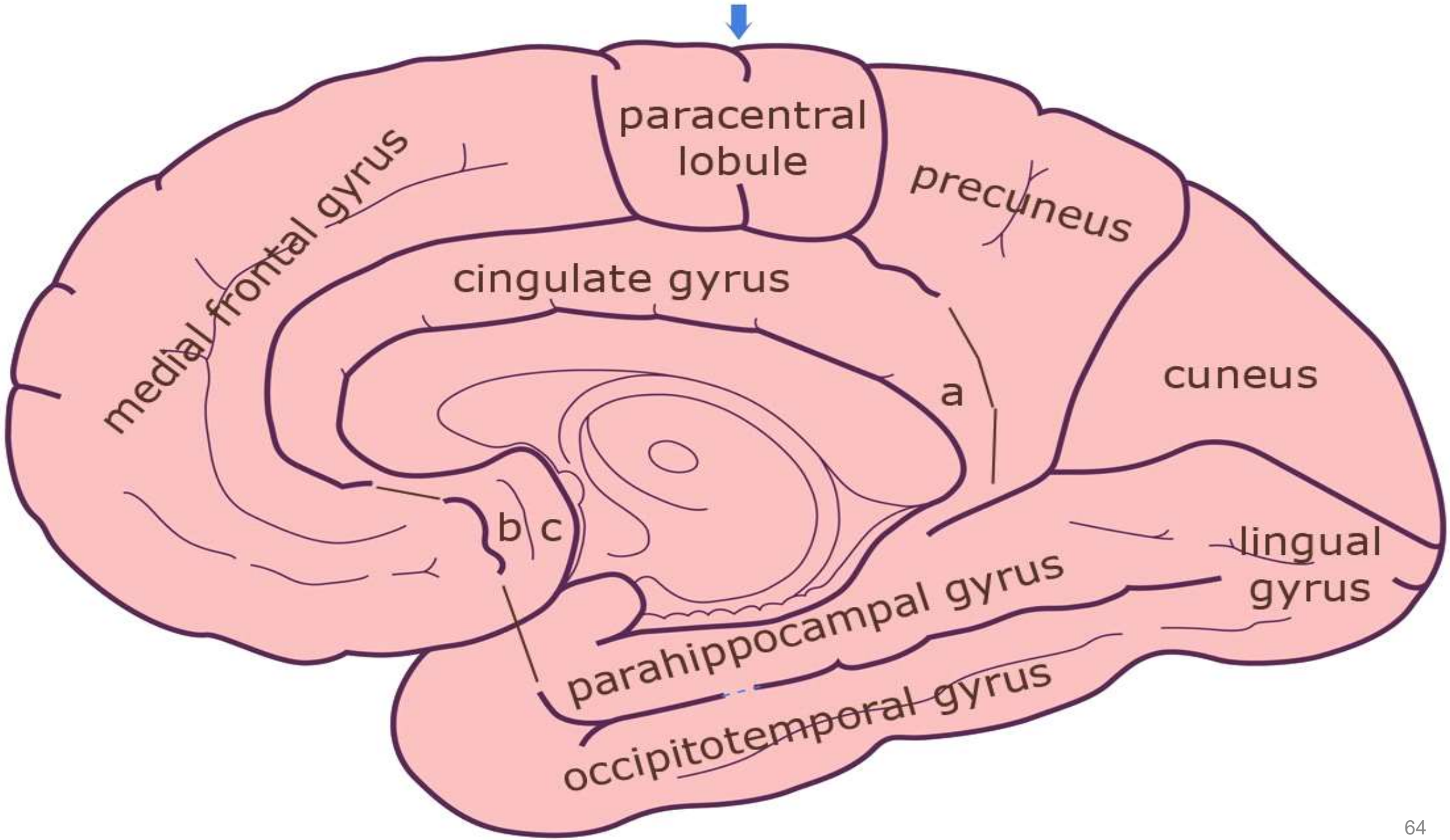


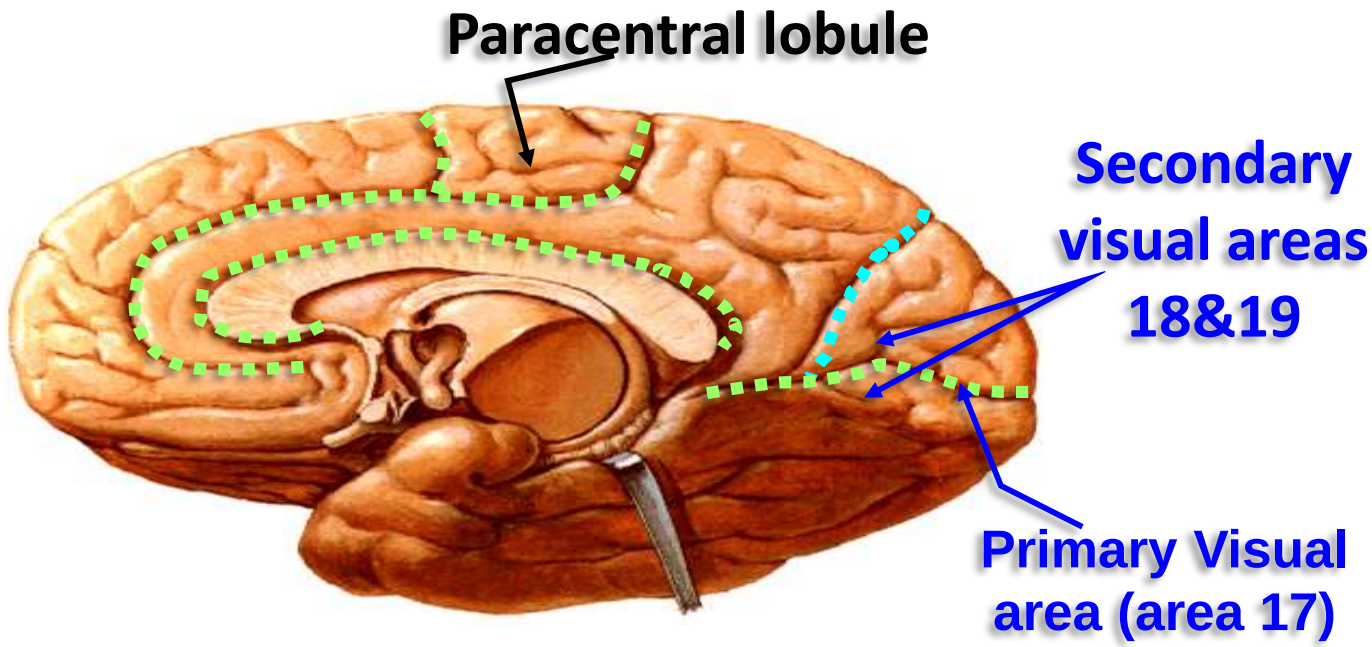
Functional and Structural Areas of the Cerebral Cortex

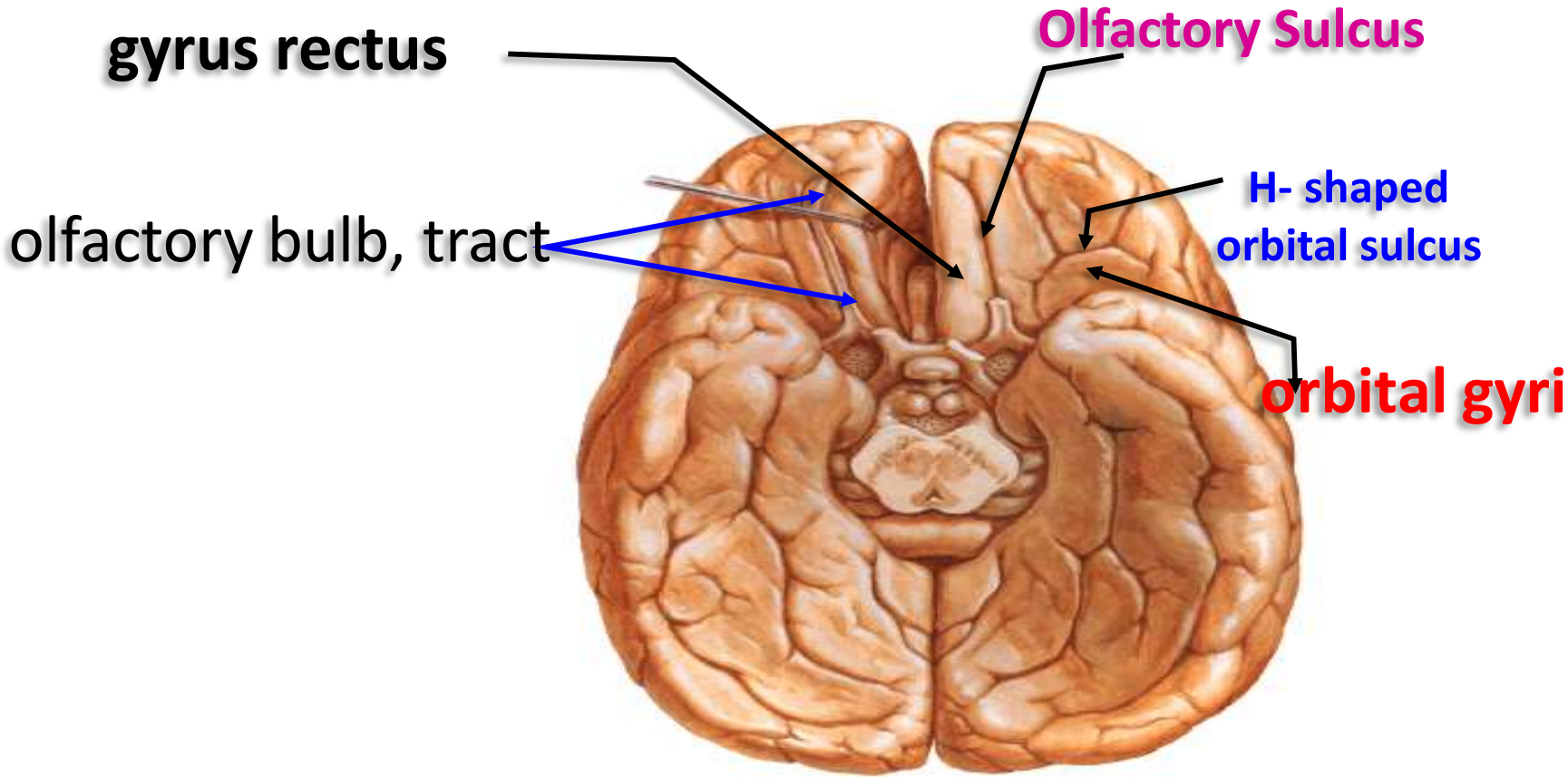


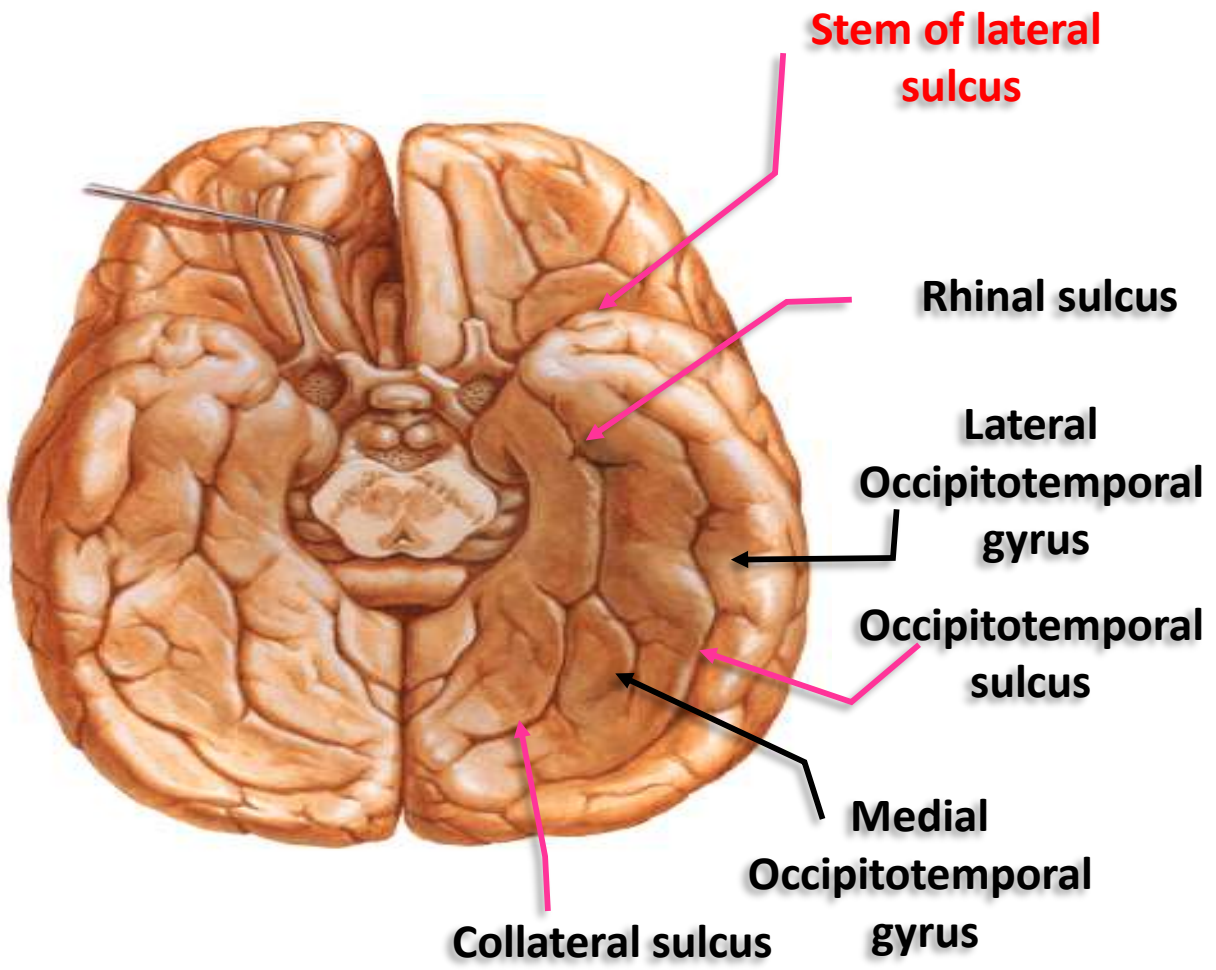

Anterior ramus
Central sulcus
posterior ramus
parieto-occipital sulcus
cingulate sulcus
callosal sulcus
calcarine sulcus


cingulate gyrus
medial frontal gyrus
paracentral lobule
precuneus
cuneus
Lingual gyrus
Parahippocampus
corpus callosum


paracentral lobule
precuneus
medial frontal gyrus
cingulate gyrus
a
cuneus
b
c
lingual gyrus
parahippocampal gyrus
occipitotemporal gyrus

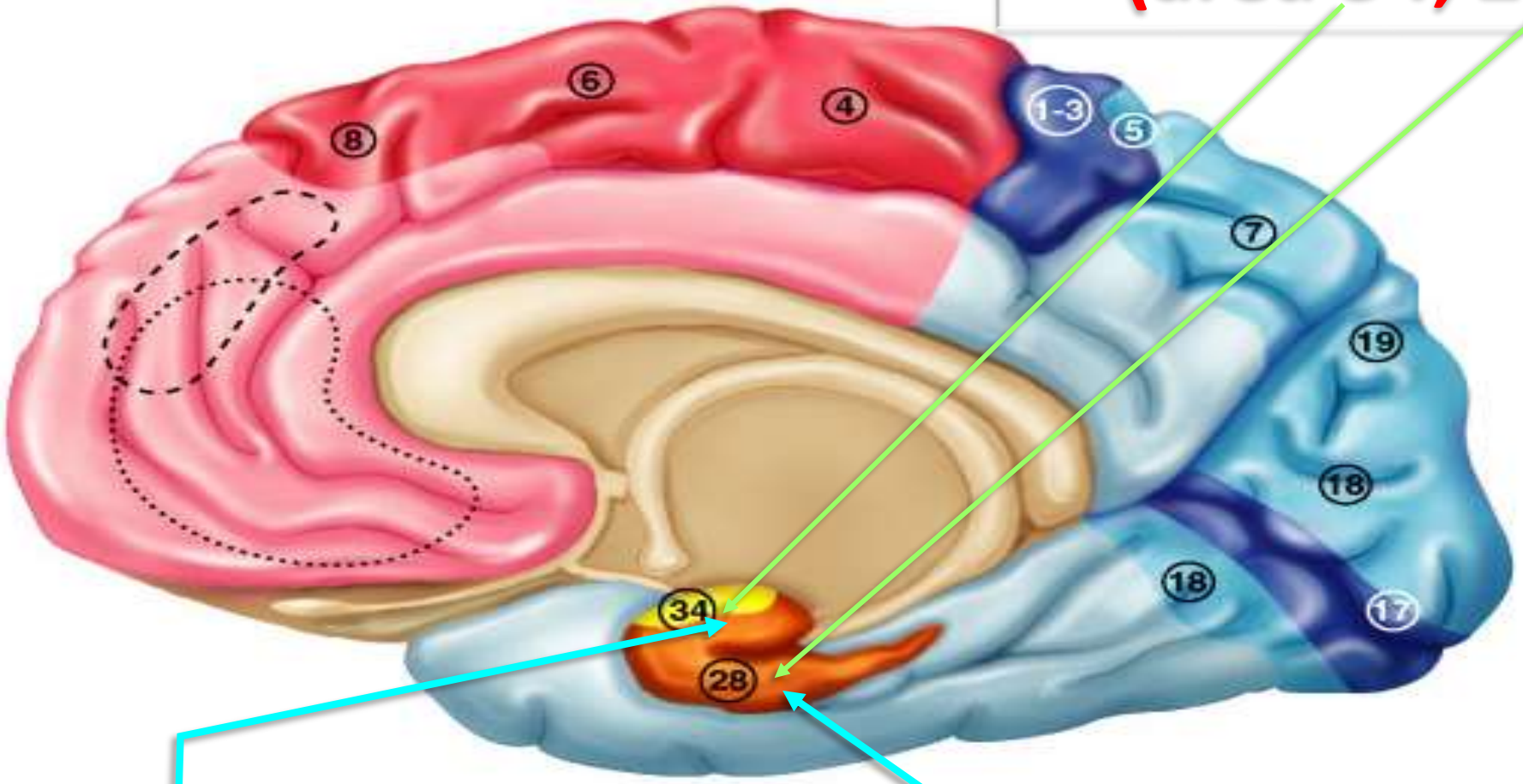

Paracentral lobule
Secondary visual areas 18&19
Primary Visual area (area 17)


gyrus rectus
olfactory bulb, tract
Olfactory Sulcus
H- shaped
orbital sulcus
orbital gyri


Stem of lateral sulcus
Rhinal sulcus
Lateral Occipitotemporal gyrus
Occipitotemporal sulcus
Medial Occipitotemporal gyrus
Collateral sulcus

Olfactory area

(area 34, 28)



uncus

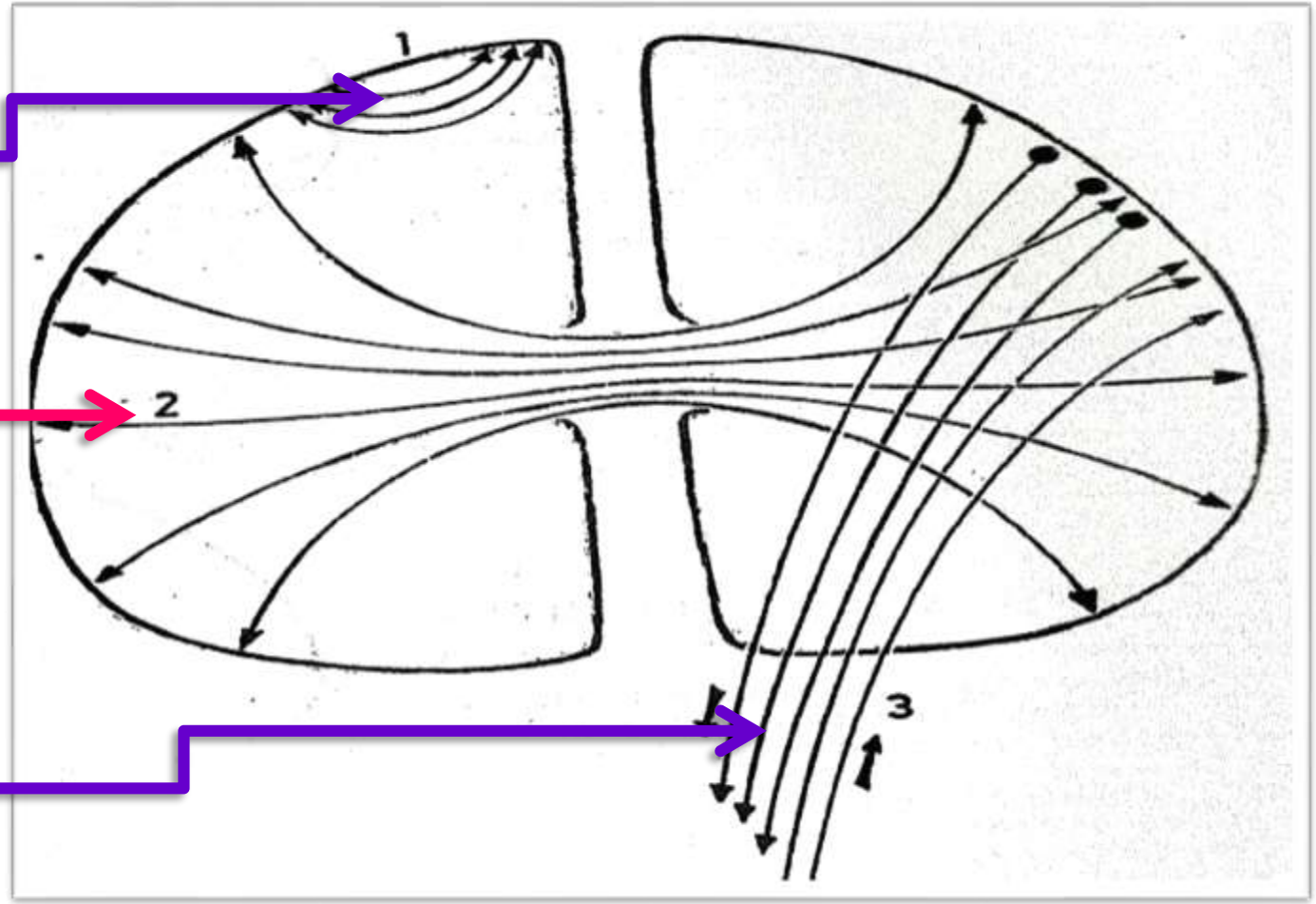
Anterior part of parahippocampal gyrus

The white matter classified into three groups

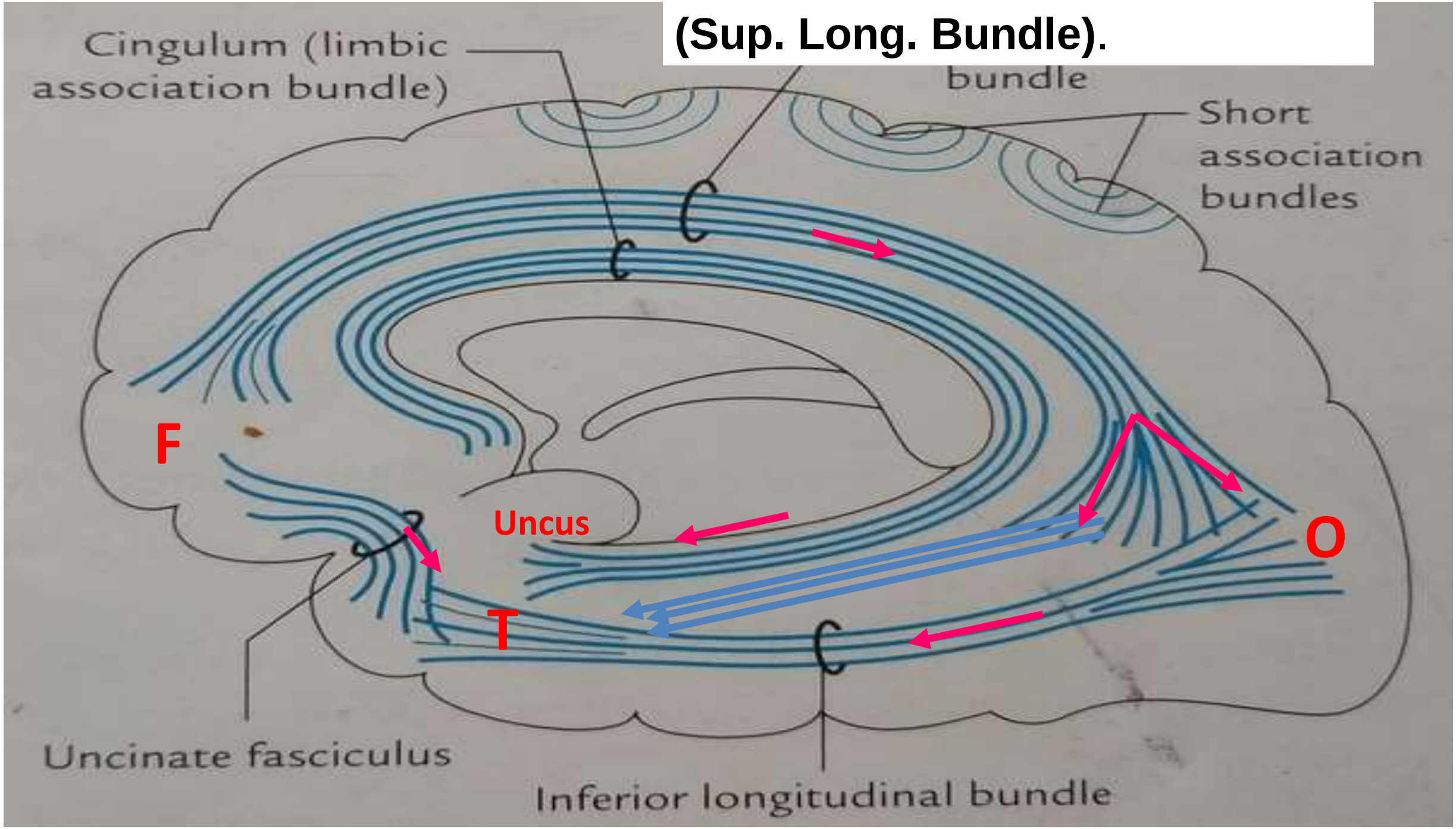
(1) Association fibers

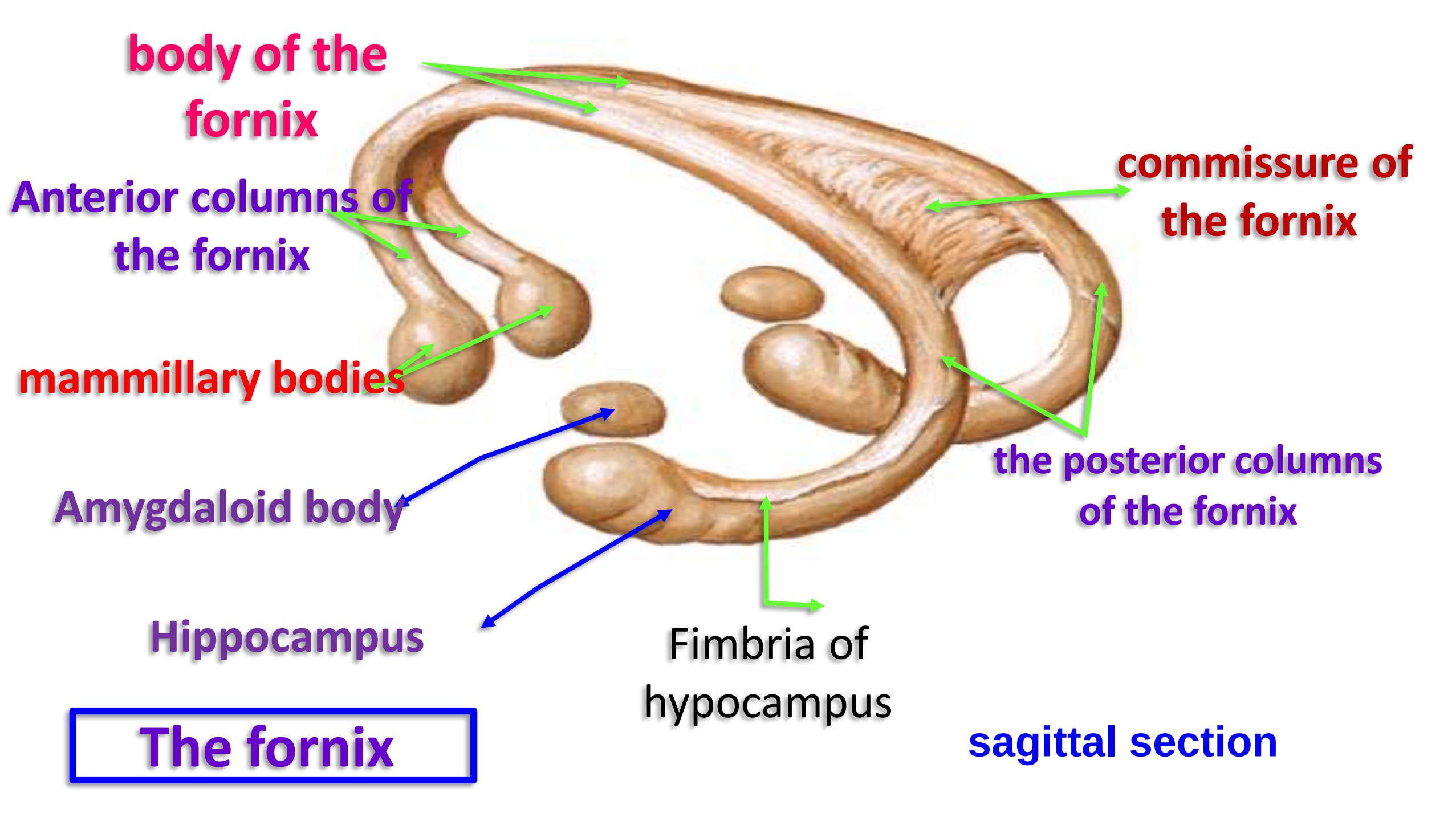
(2) Commissural fibers

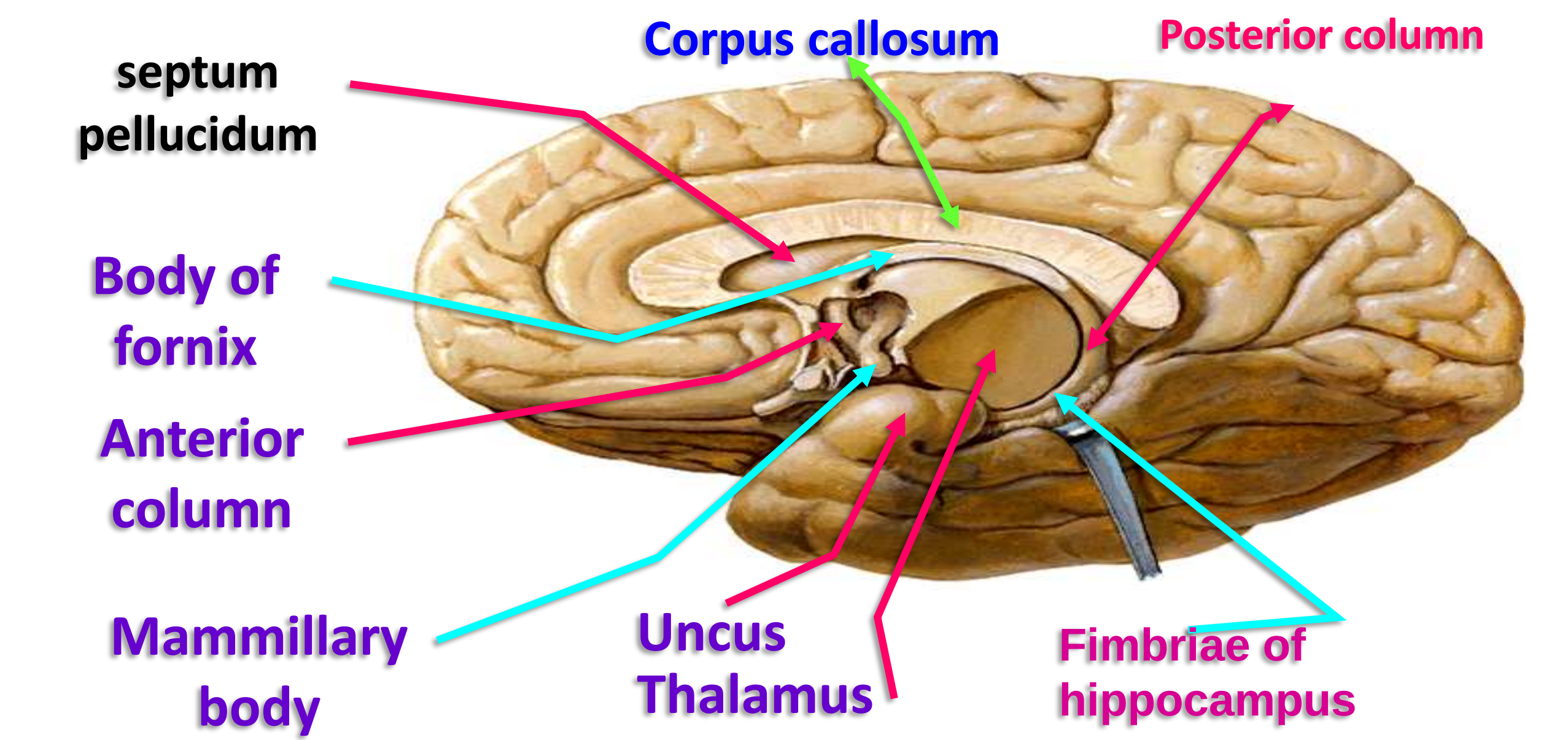
(3) Projection fibers



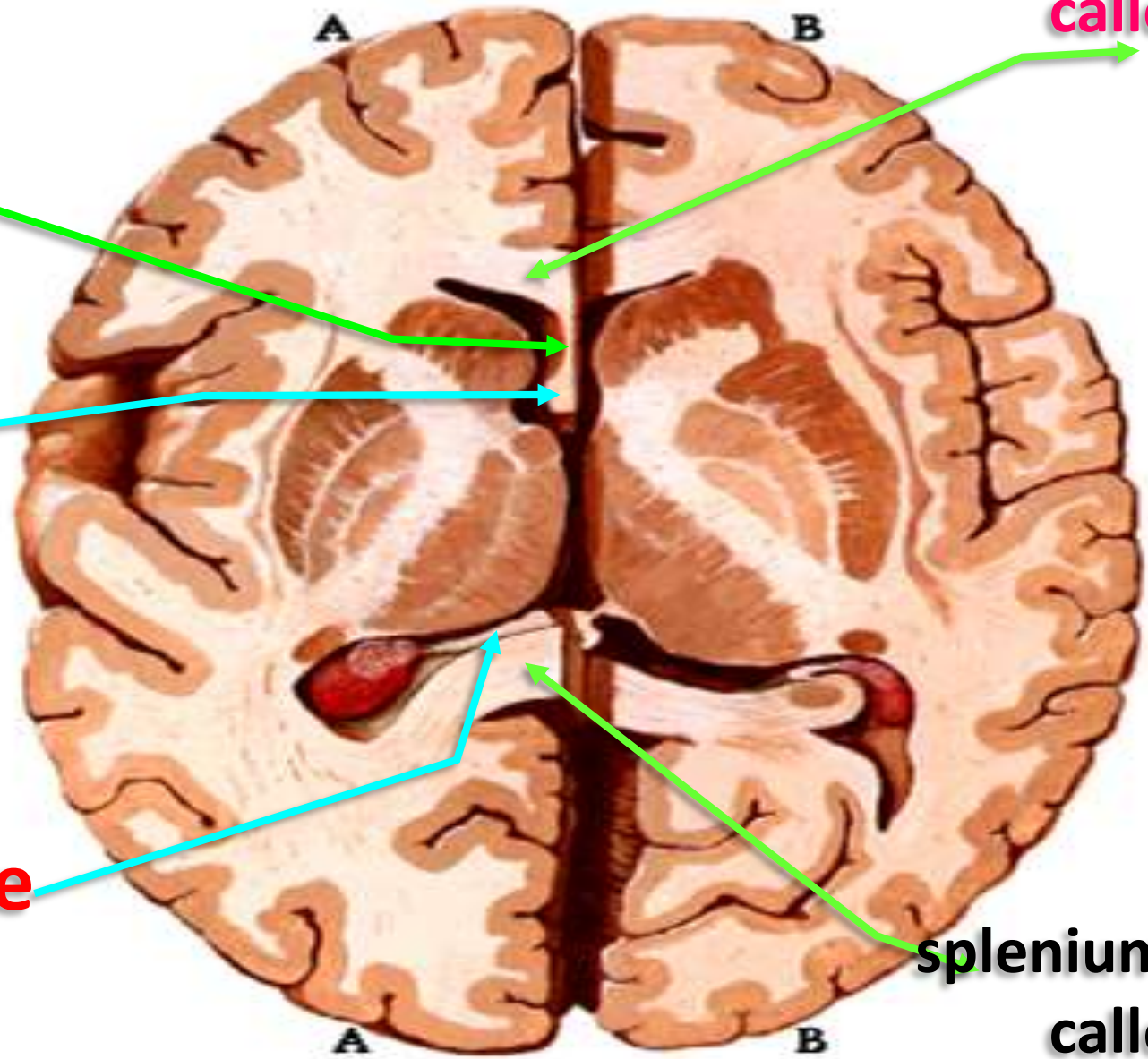
(Sup. Long. Bundle).




body of the fornix
Anterior columns of the fornix
mammillary bodies
Amygdaloid body
Hippocampus
Fimbria of hypocampus
commissure of the fornix
the posterior columns of the fornix
The fornix
sagittal section



Parts & relations of fornix, sagittal section



Genu of corpus callosum

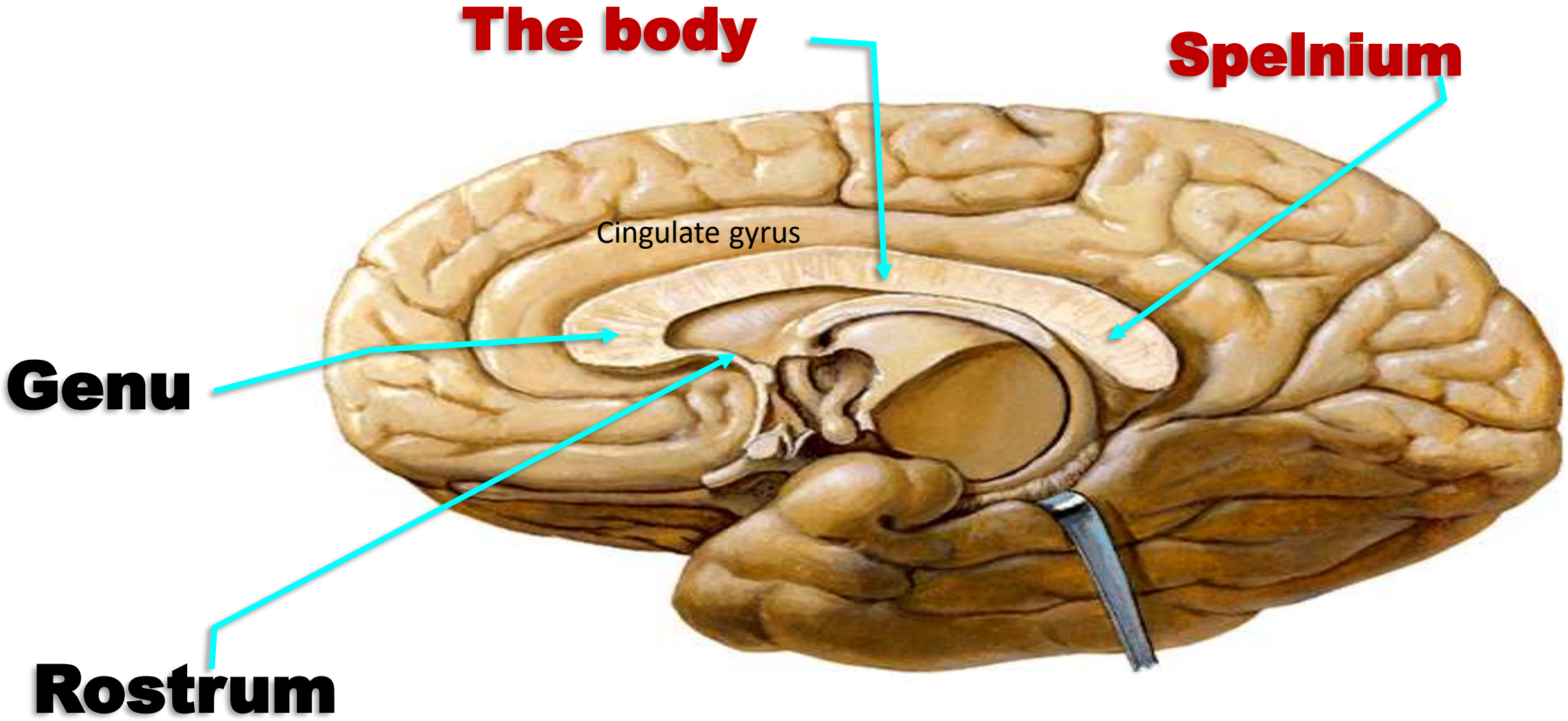
septum pellucidum

anterior columns of the fornix

the crus of the fornix

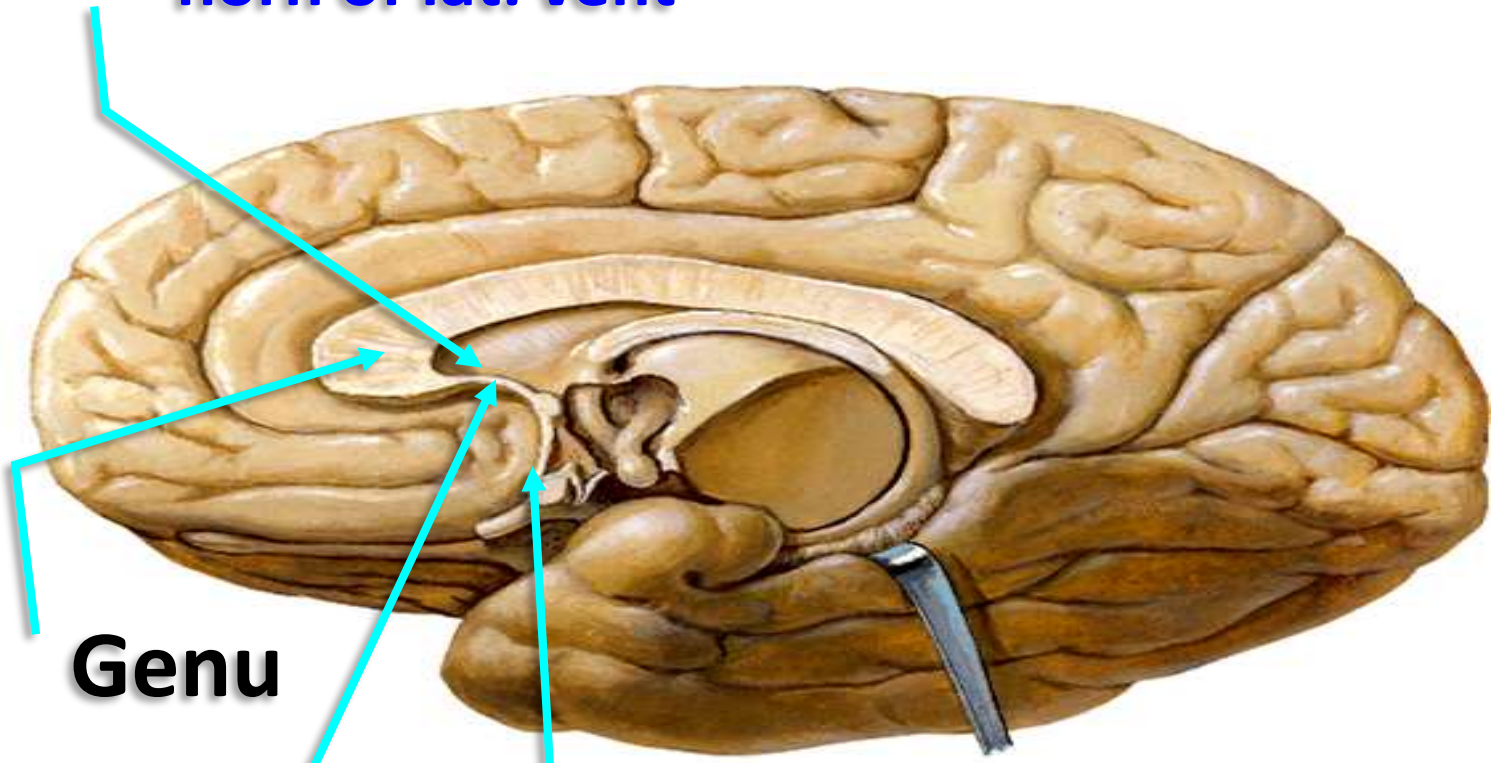
splenium of corpus callosum

Horizontal section of the brain



❖ Corpus callosum

septum pellucidum & Ant horn of lat. vent

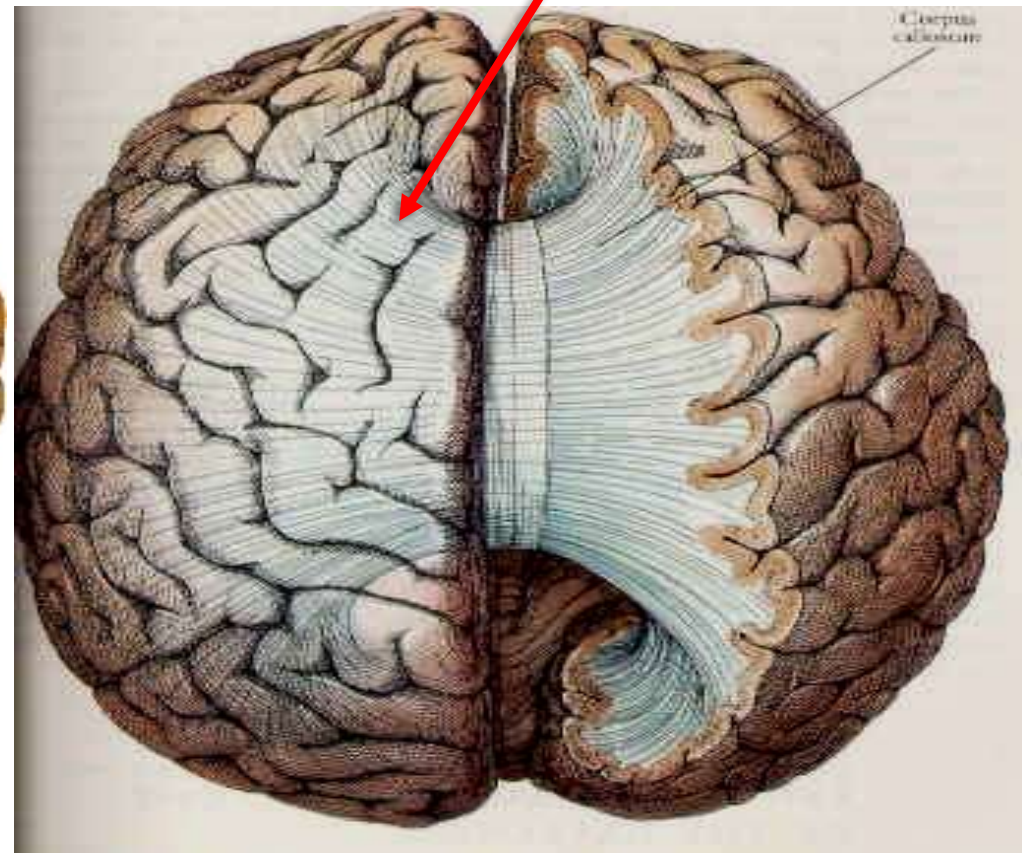


Genu

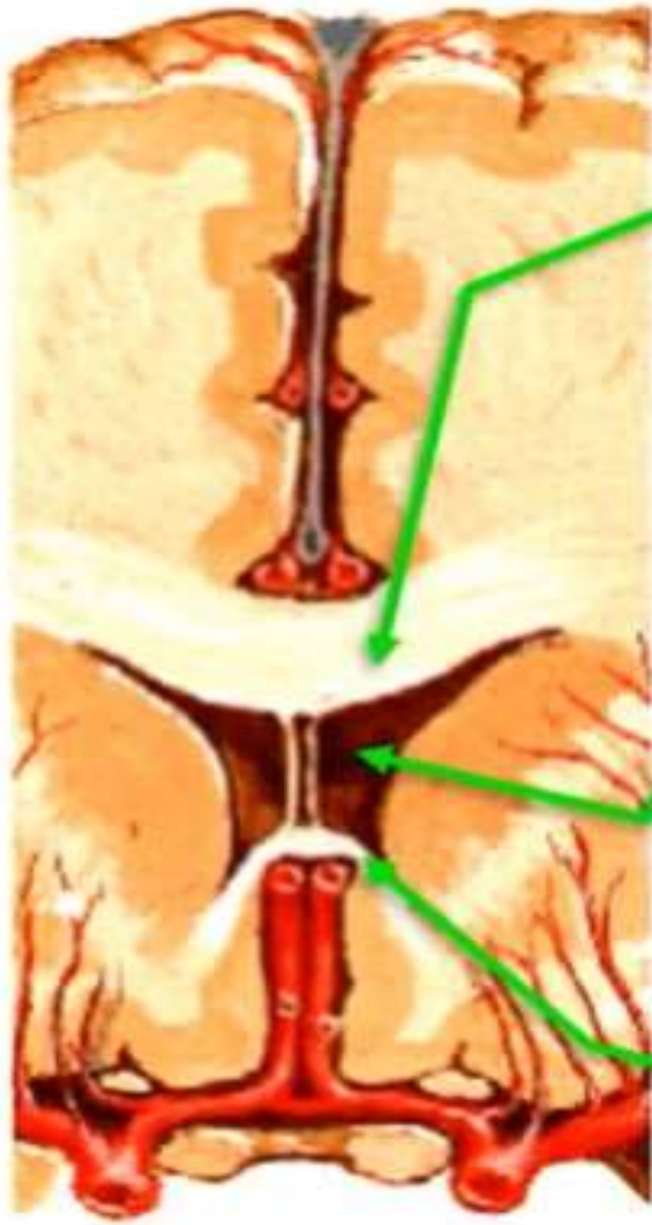
Rostrum

lamina terminalis

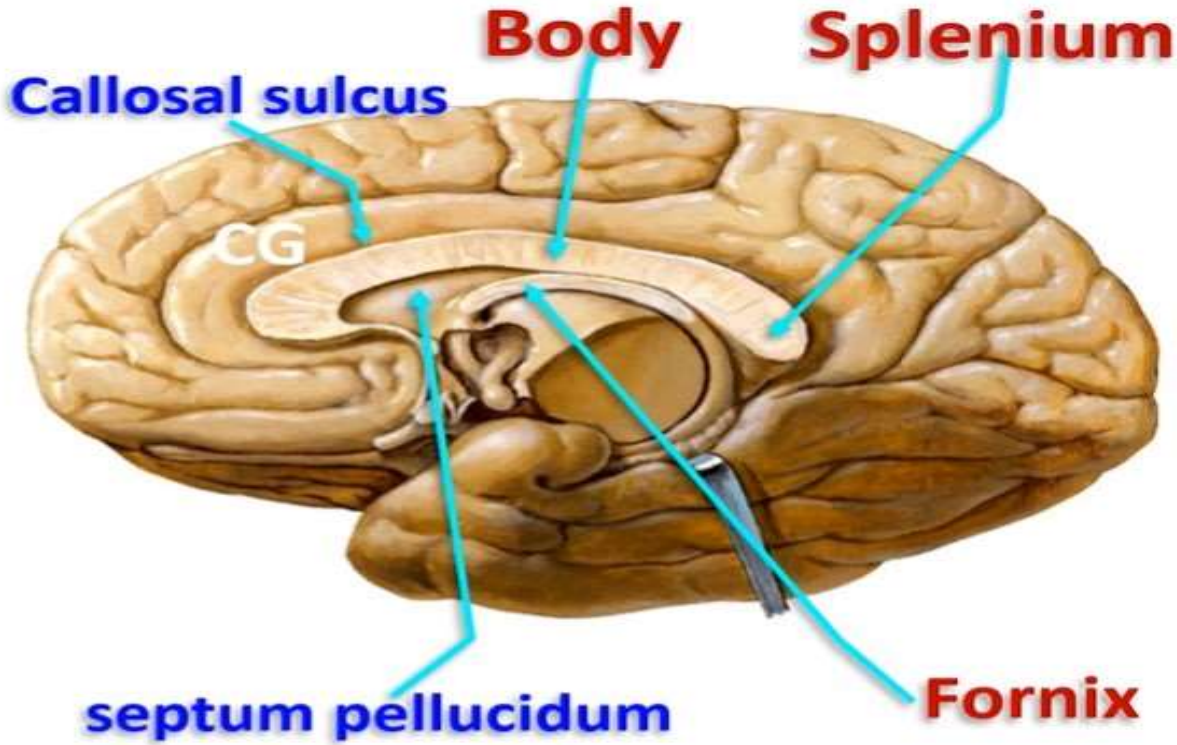
forceps minor is projection from genu



❖ Corpus callosum

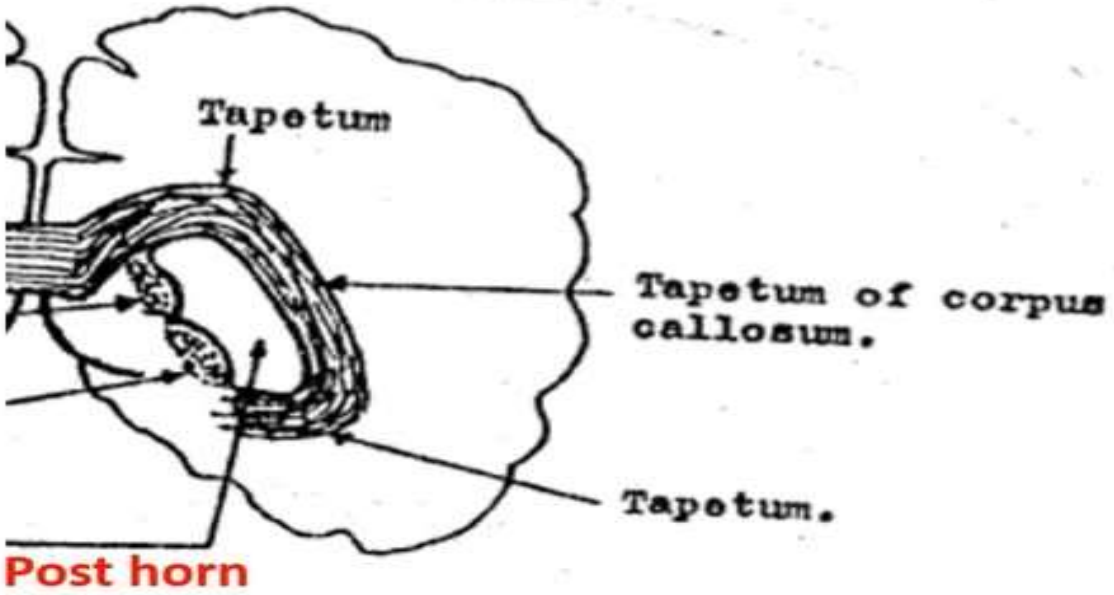

Genu
anterior horn of the lateral ventricle
Rostrum

Coronal section

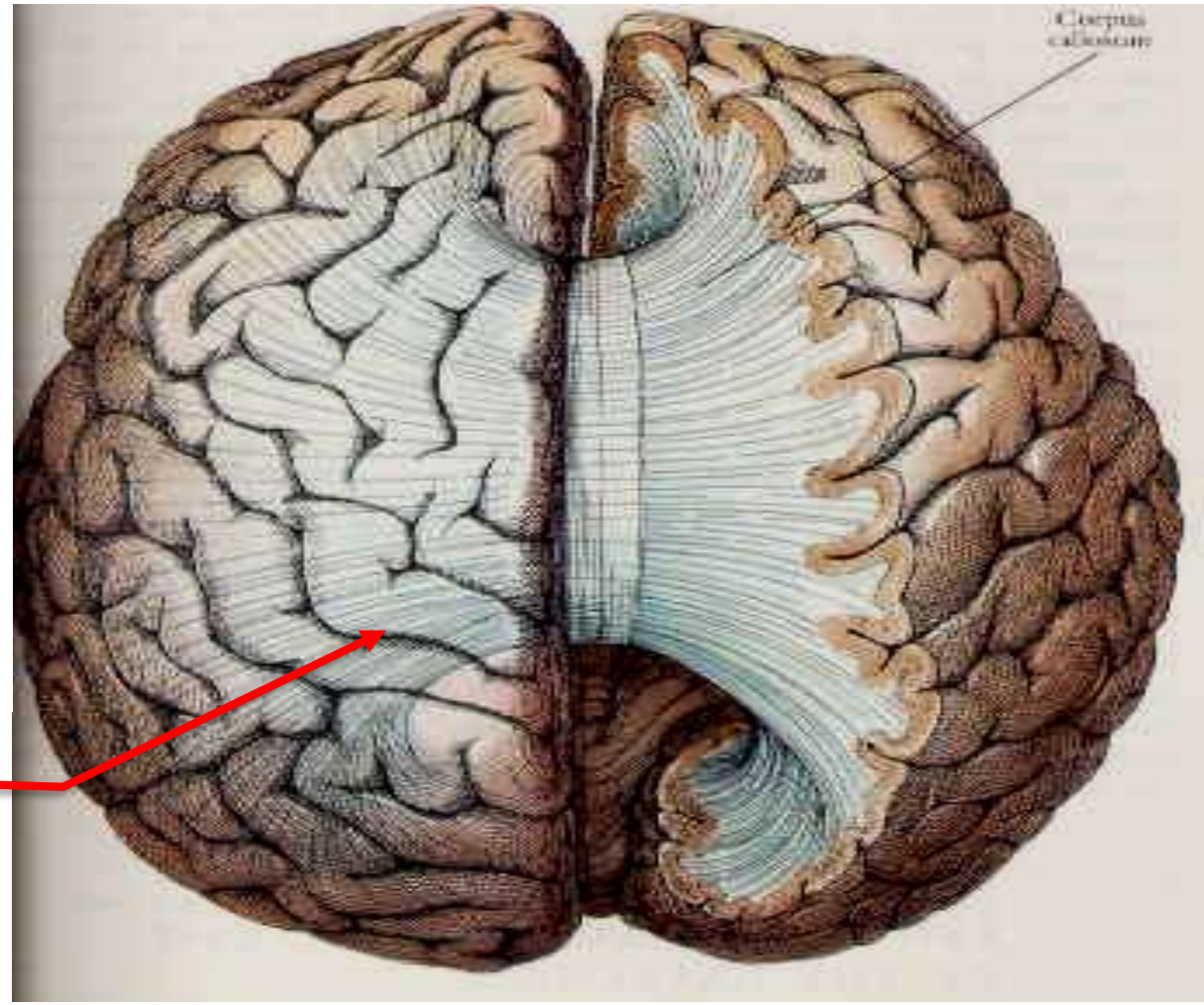


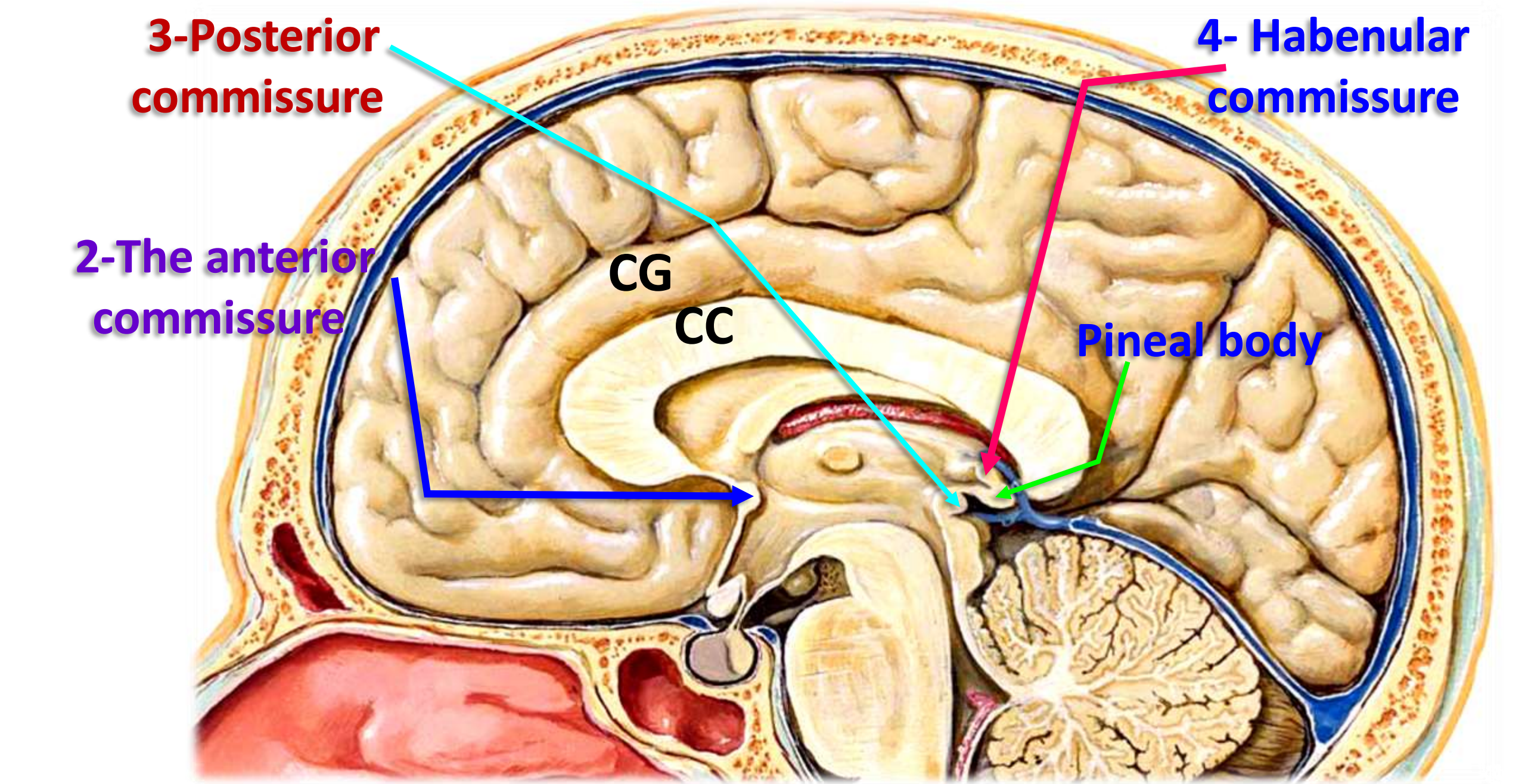
Sagittal section

❖Corpus callosum



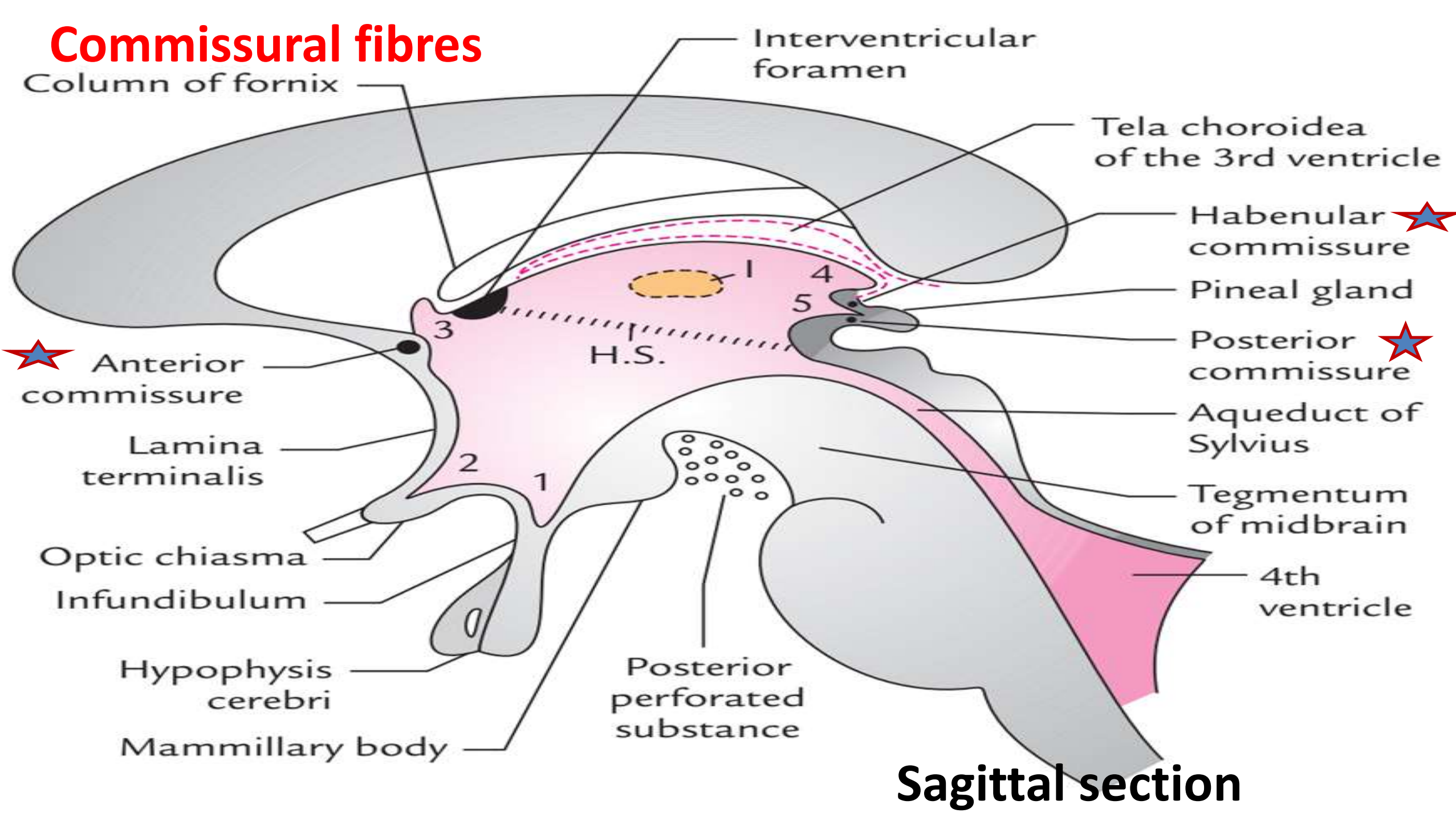
forceps major is projection from splenium



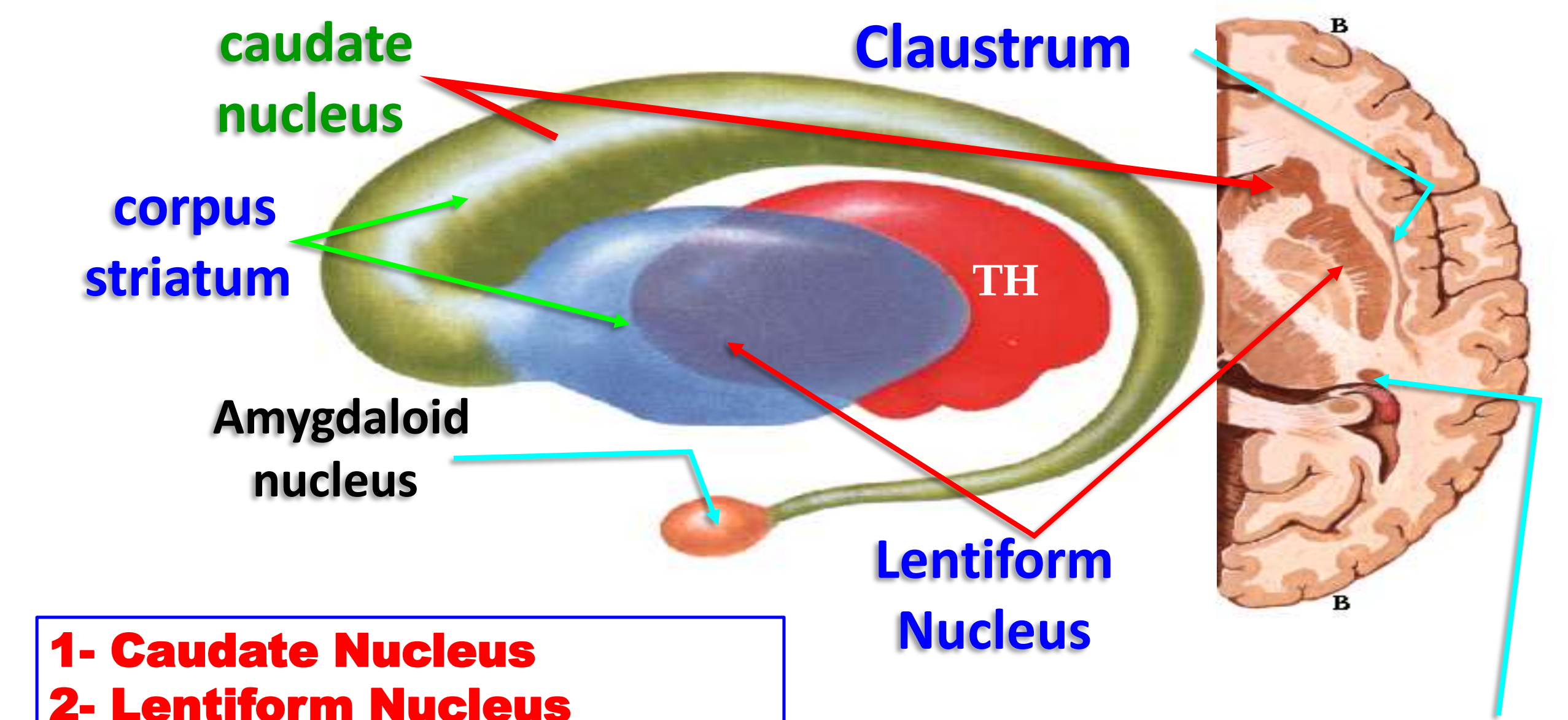


Sagittal section

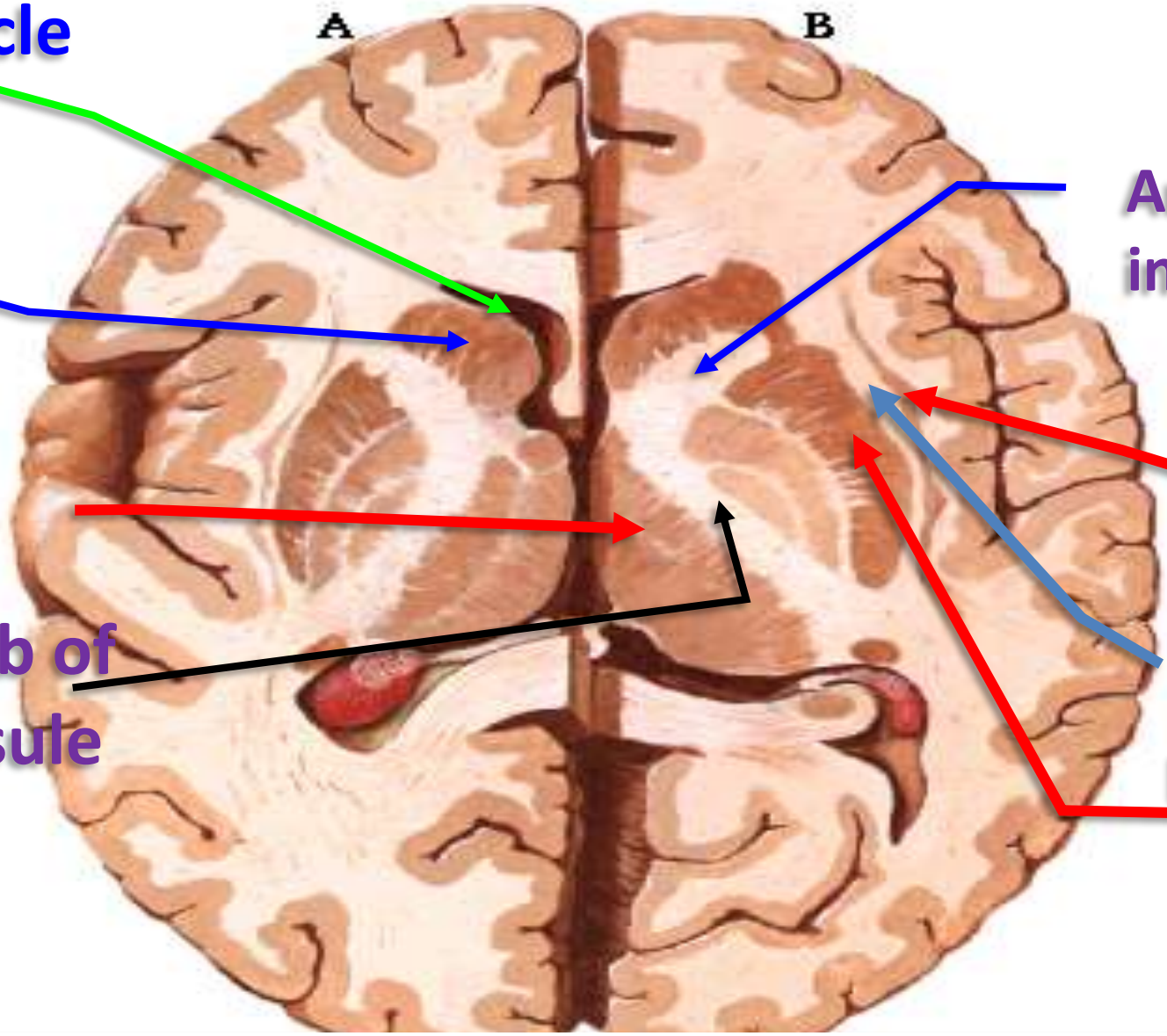
Commissural fibres



Sagittal section

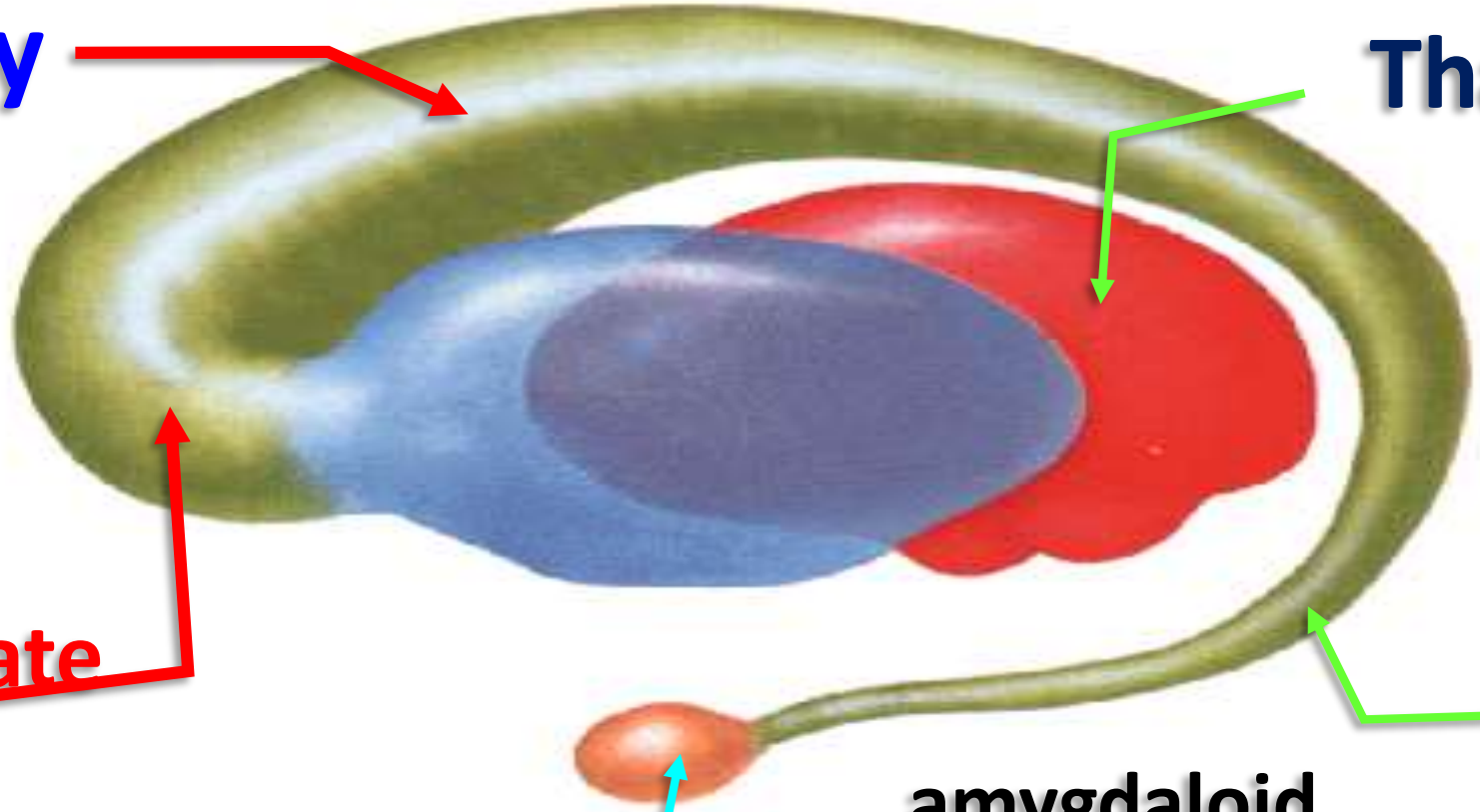


1- Caudate Nucleus
2- Lentiform Nucleus
3- Claustrum
4- Amygdaloid body

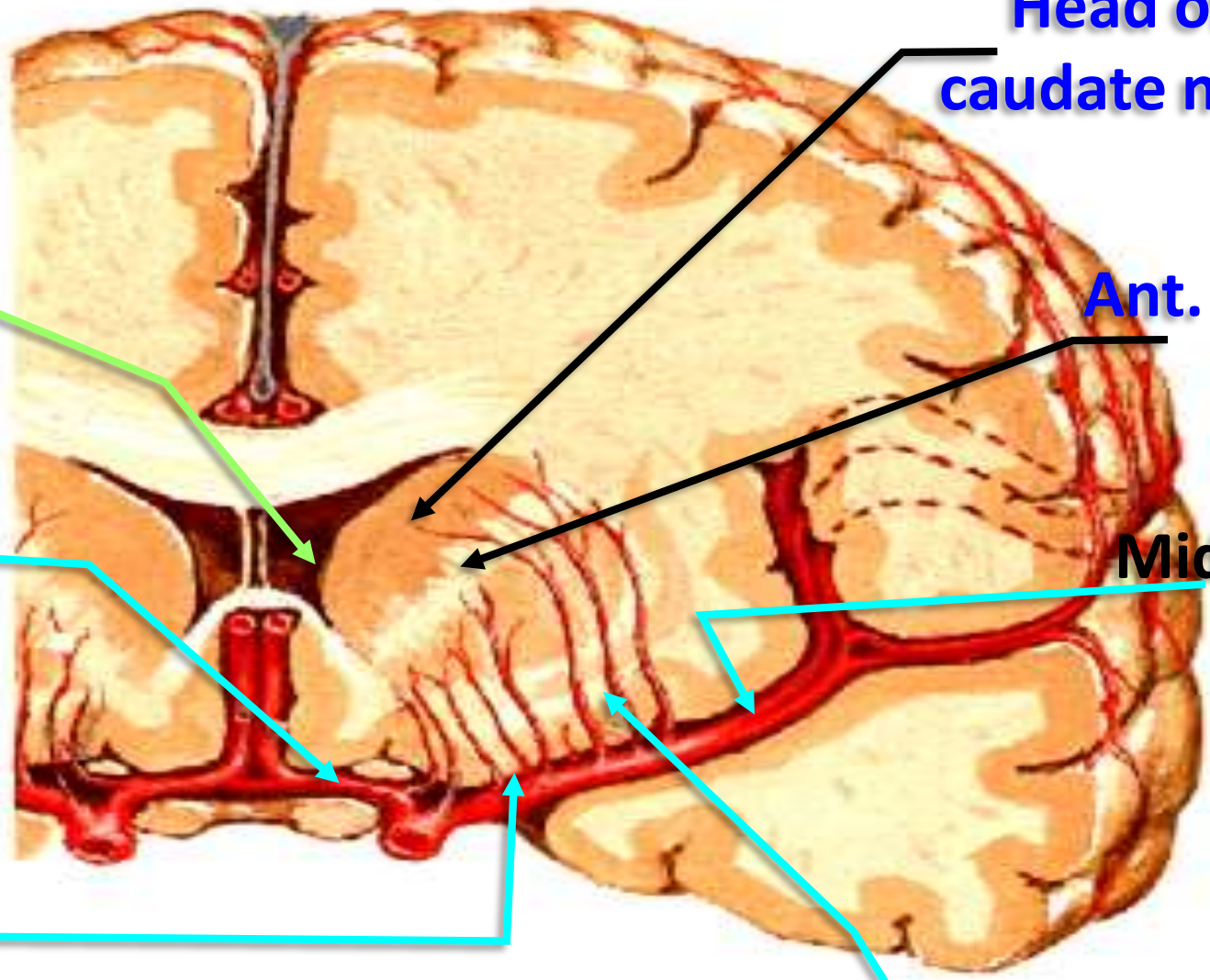


T.S.

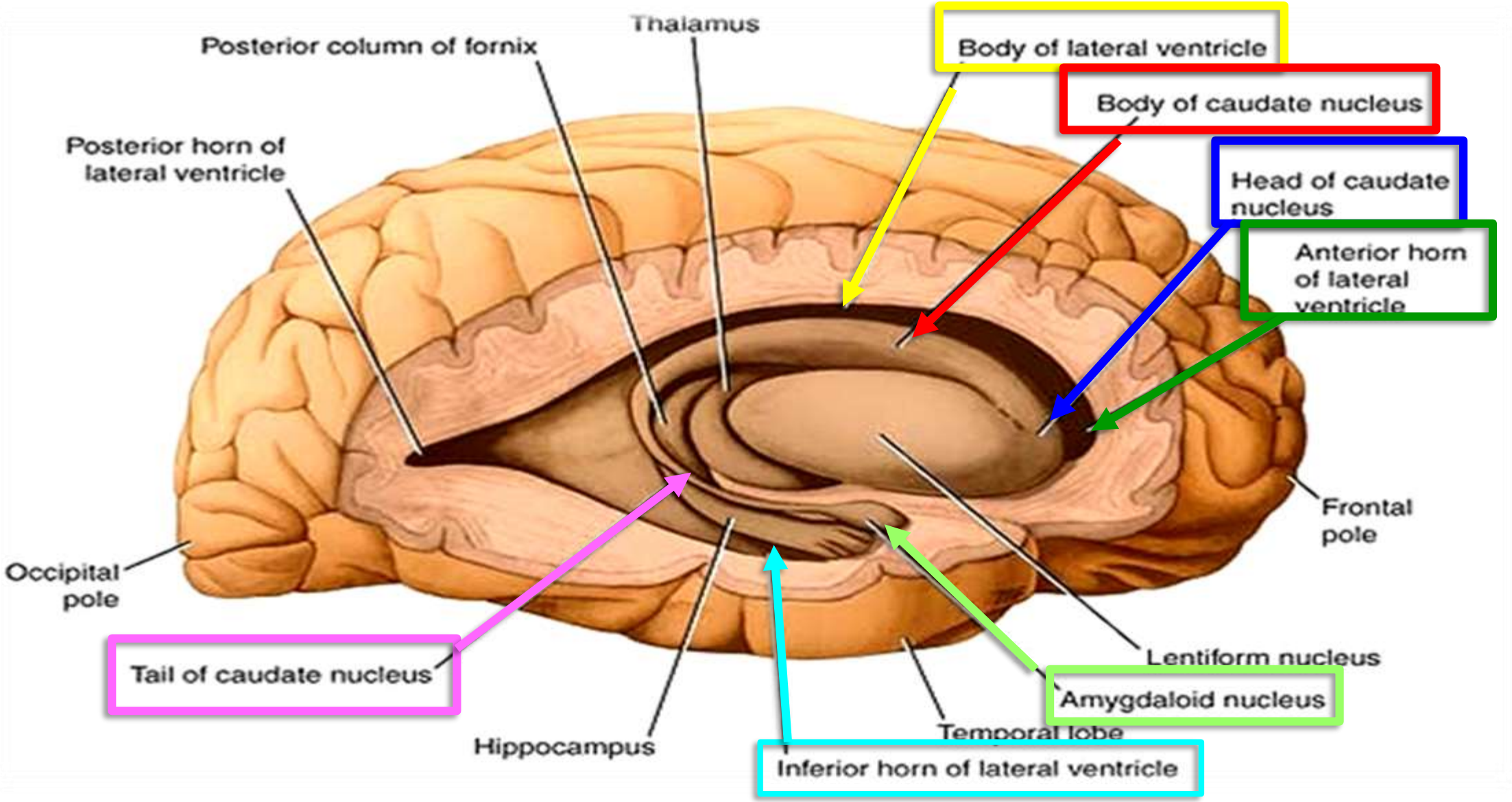
They play an important role in the control of posture and voluntary movement.



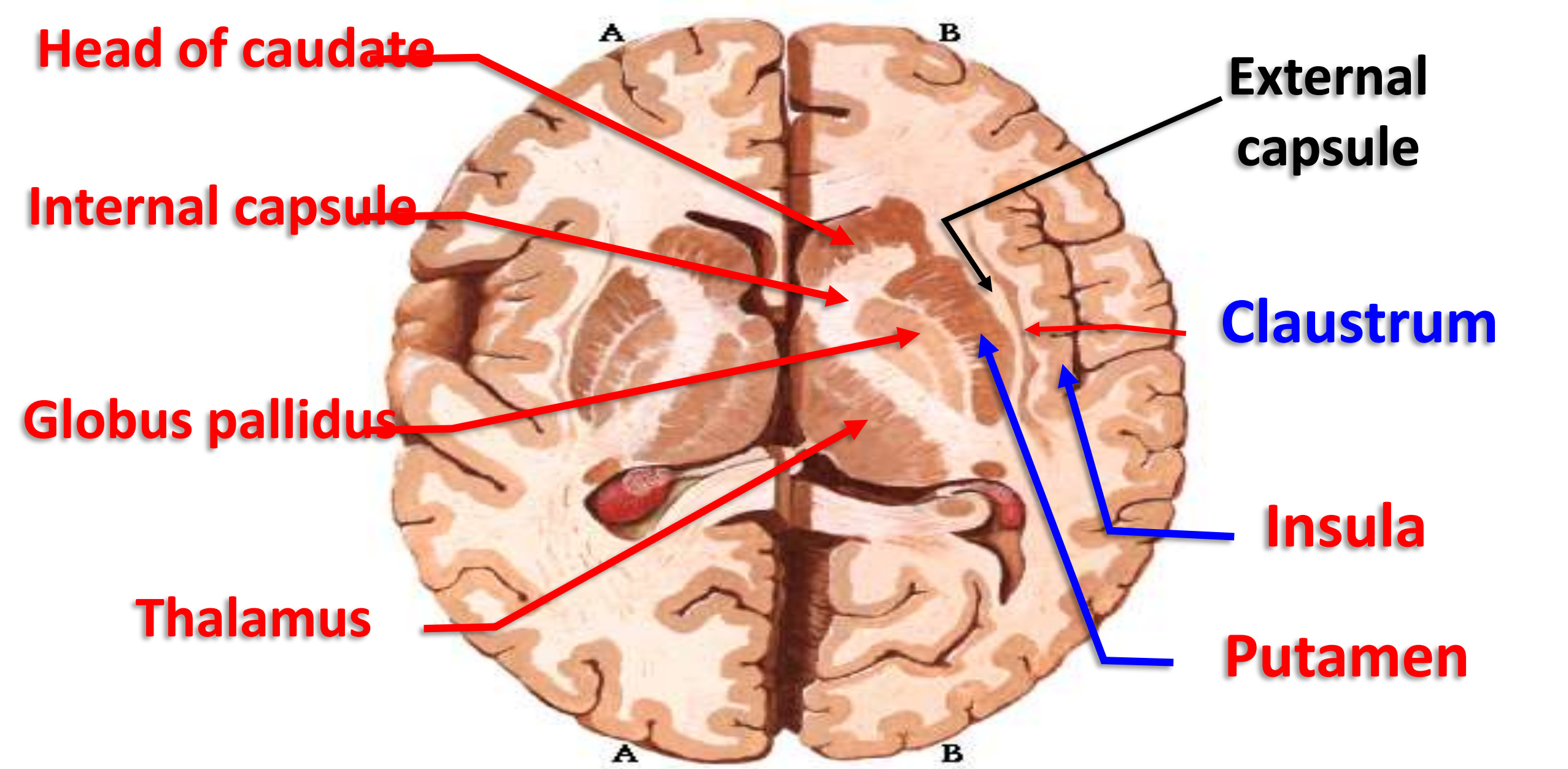
The caudate nucleus can be divided into a head, a body, and a tail



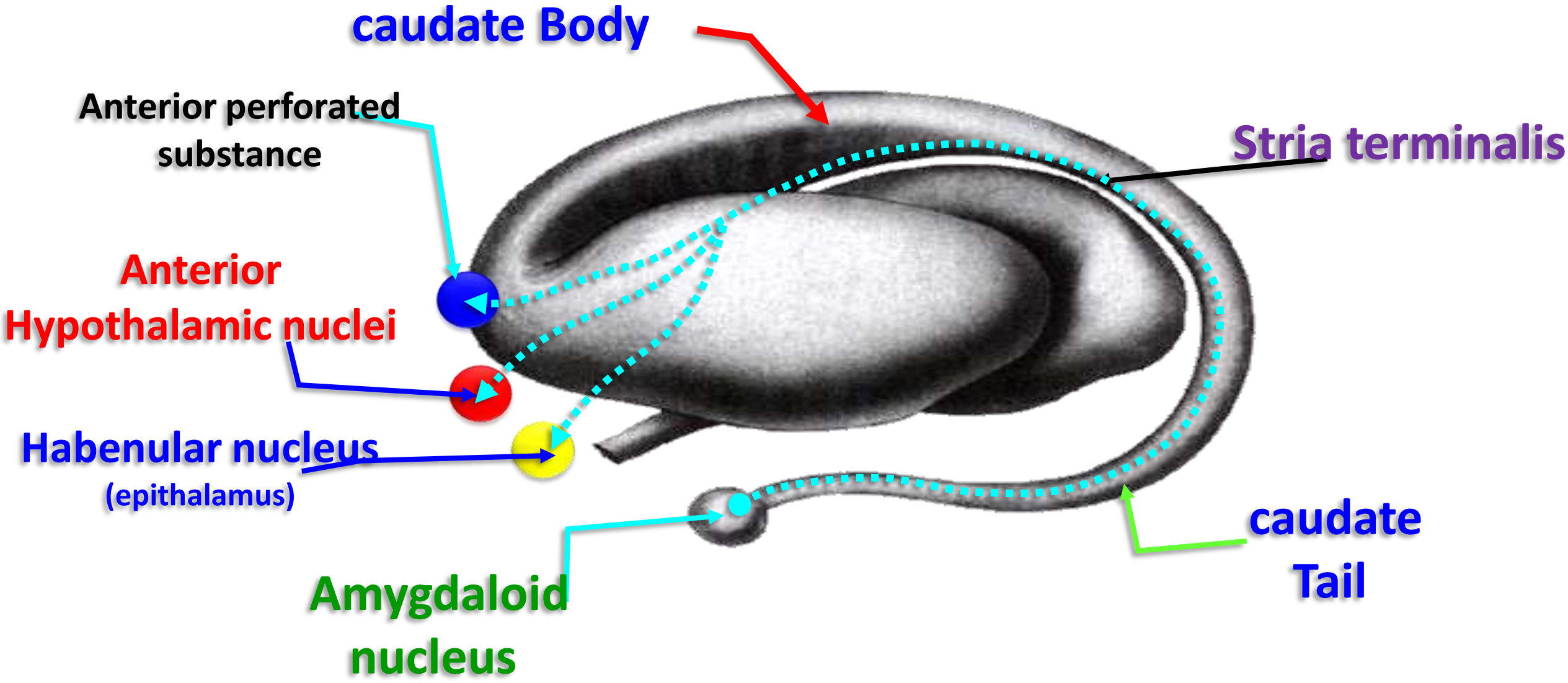
Head of caudate

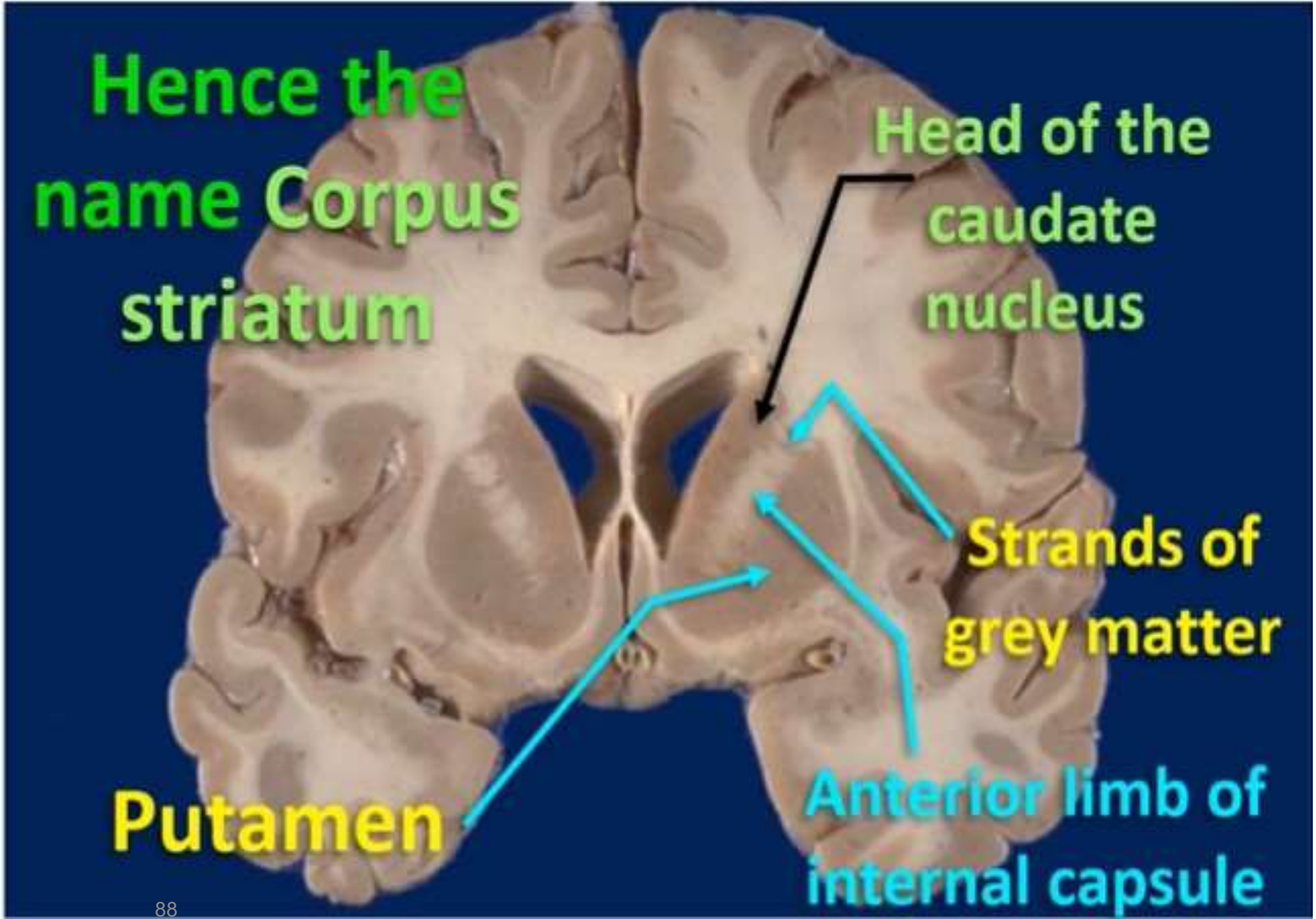


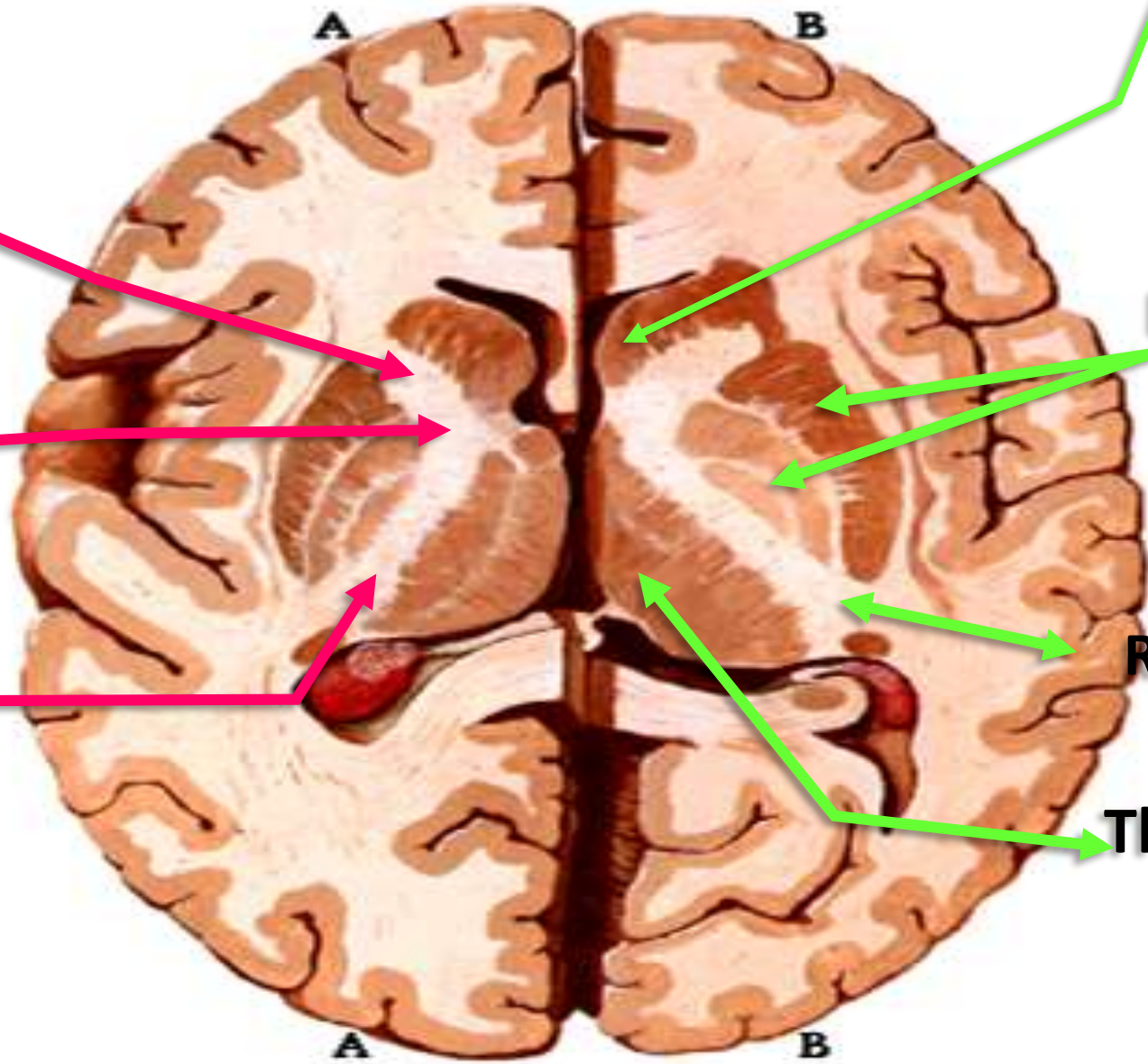
The whole length of the convexity of caudate nucleus projects into the lateral ventricle LS



Lentiform Nucleus


caudate Body
Anterior perforated substance
Stria terminalis
Anterior Hypothalamic nuclei
Habenular nucleus (epithalamus)
caudate Tail
Amygdaloid nucleus


Hence the name Corpus striatum
Head of the caudate nucleus
Strands of grey matter
Putamen
Anterior limb of internal capsule



Head of caudate

Anterior limb

Lentiform nucleus

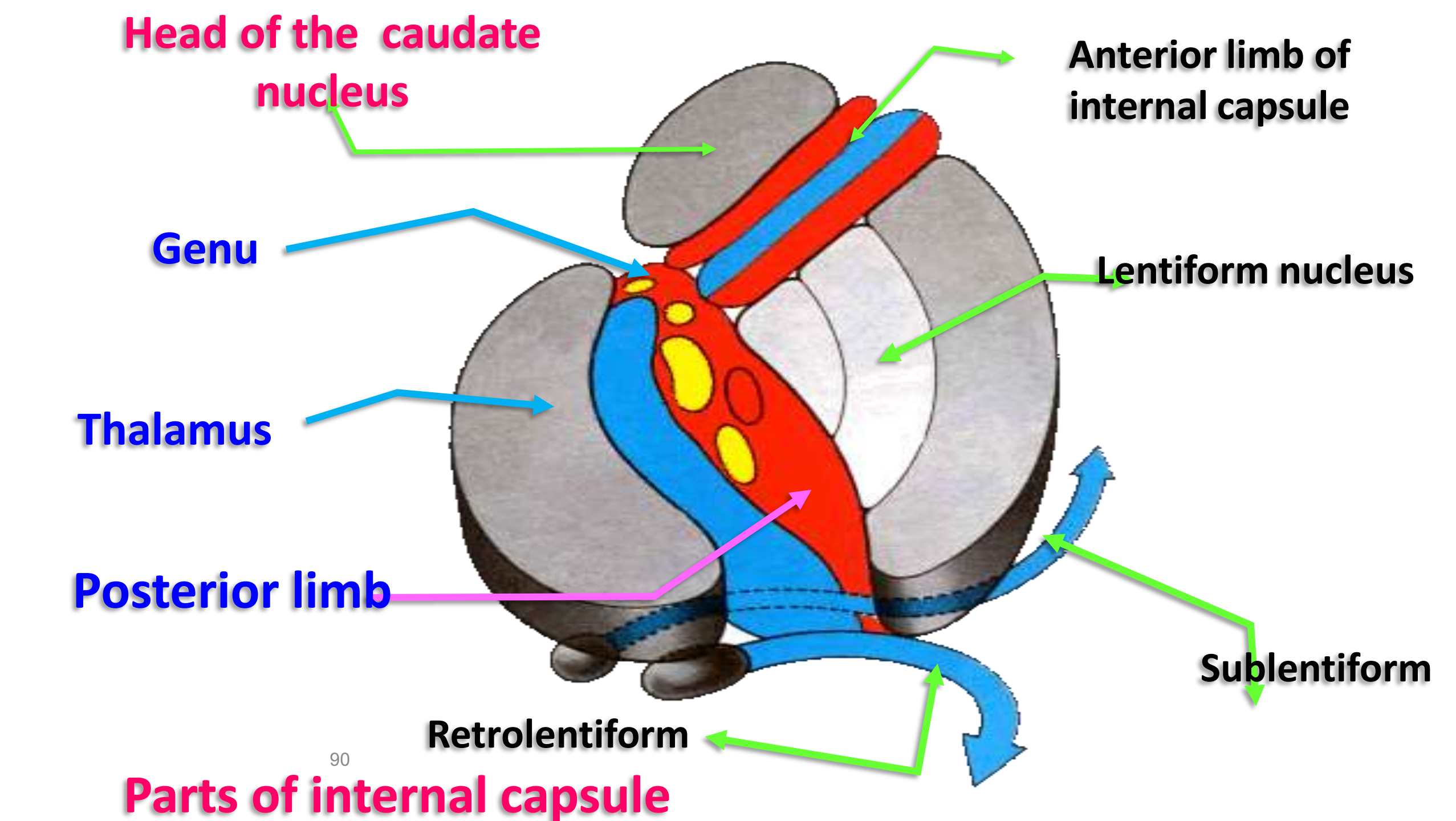
Genu

Posterior limb

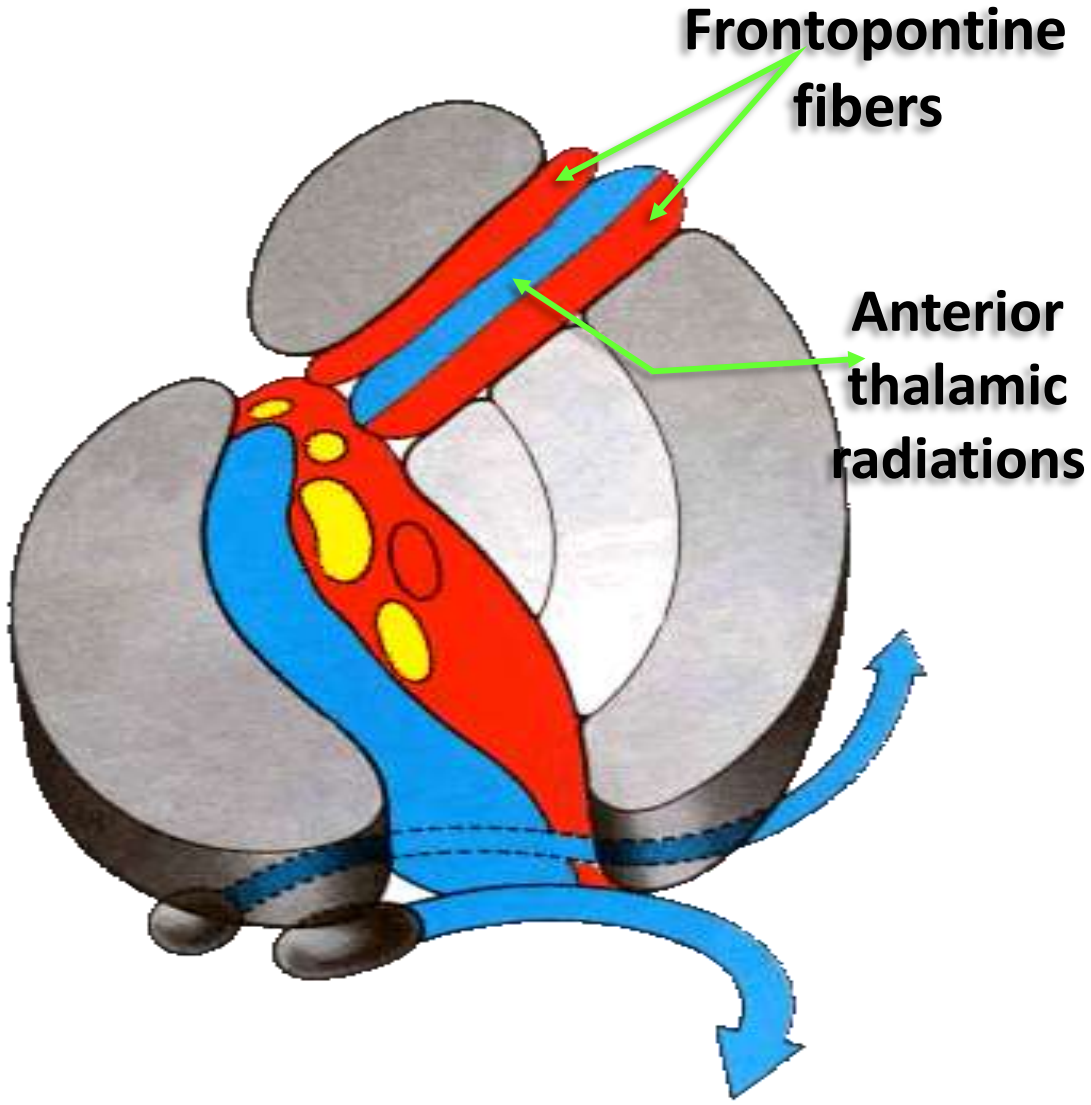
Retrolentiform

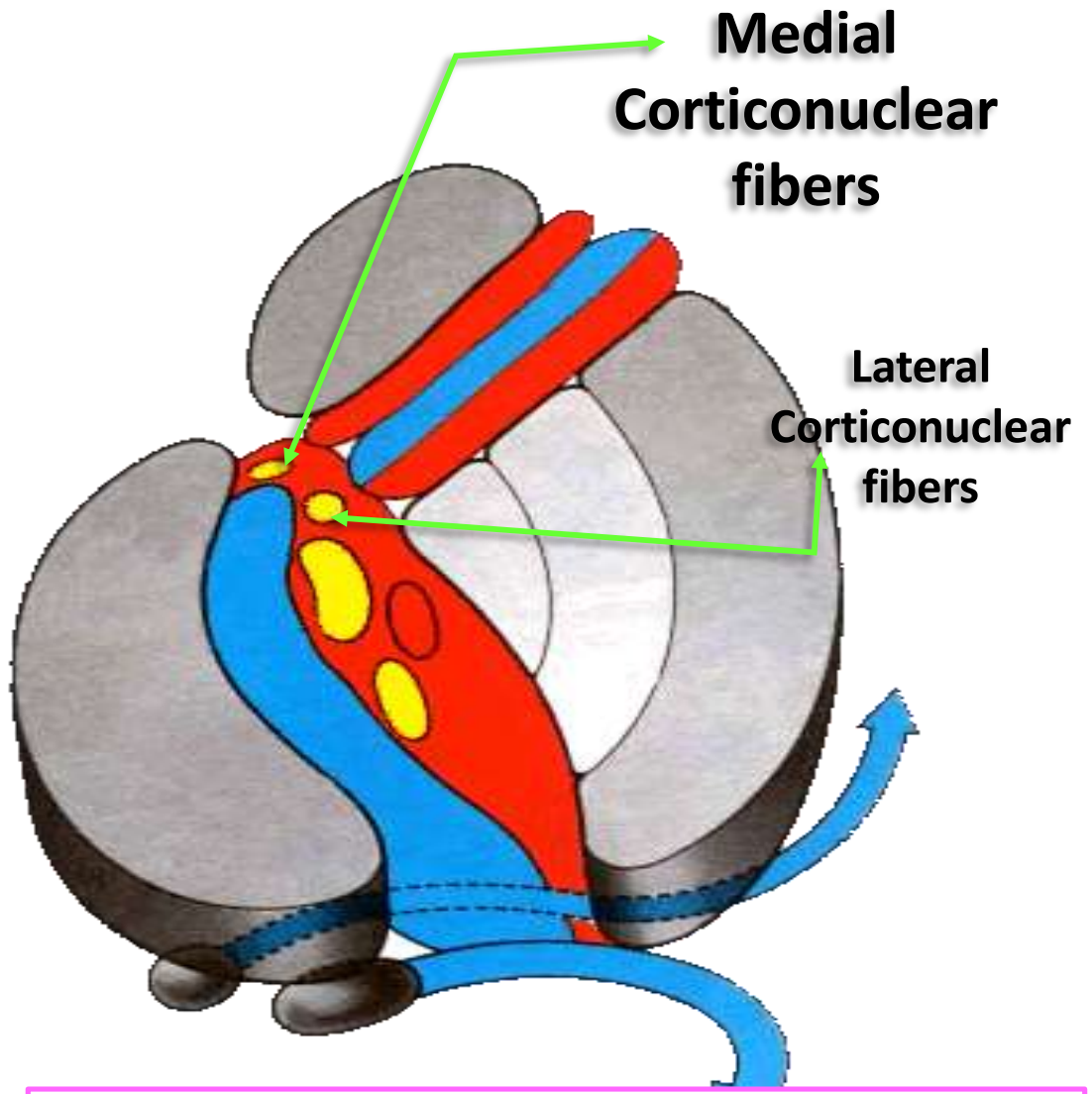
Thalamus

Parts of internal capsule



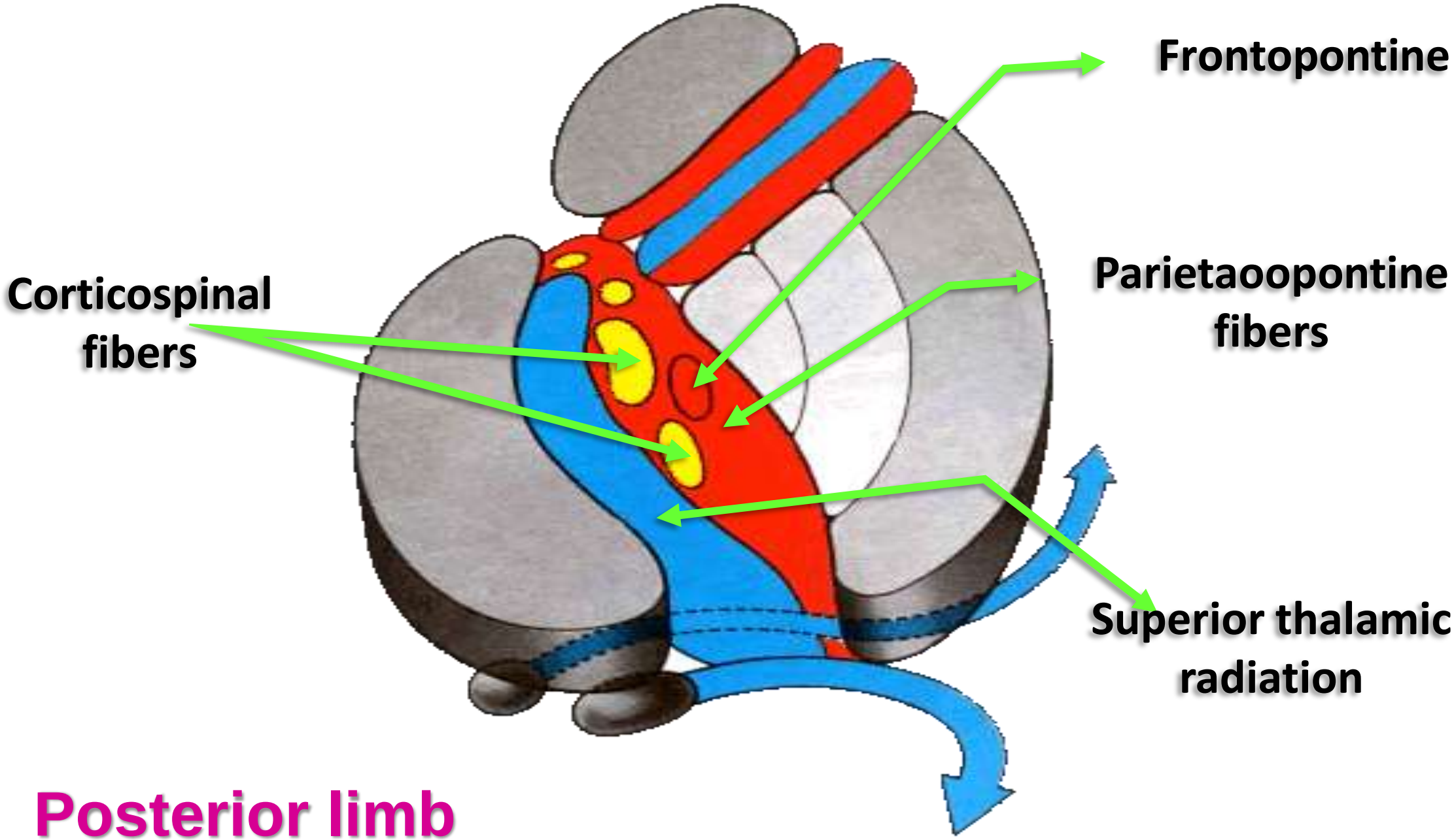
Parts of internal capsule


Frontopontine fibers
Anterior thalamic radiations



Genu

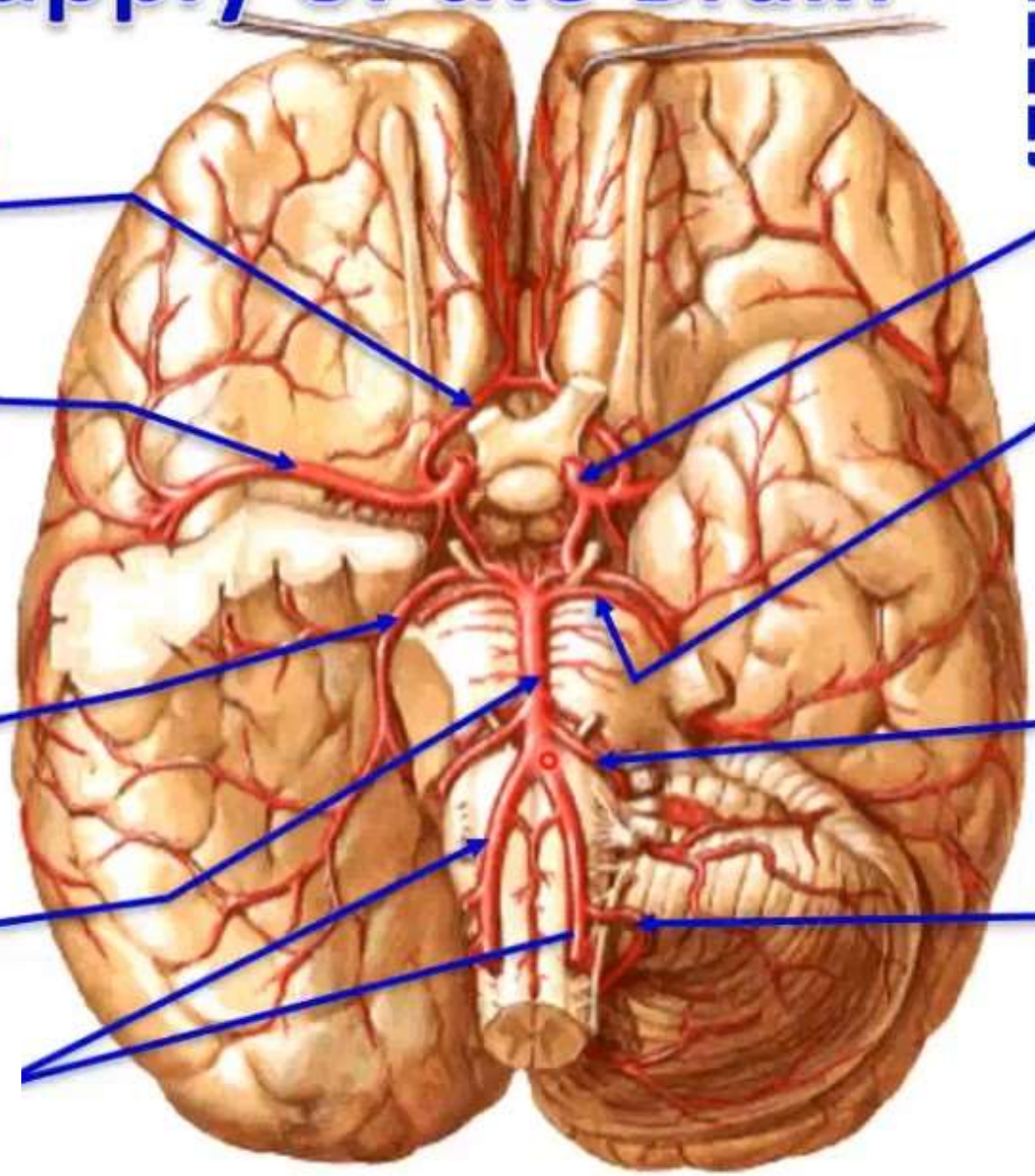
Descending tracts



Posterior limb

Blood Supply of the Brain

Vertebral system
Carotid system



Anterior cerebral Artery

Middle cerebral Artery

Posterior cerebral Artery

Basilar Artery

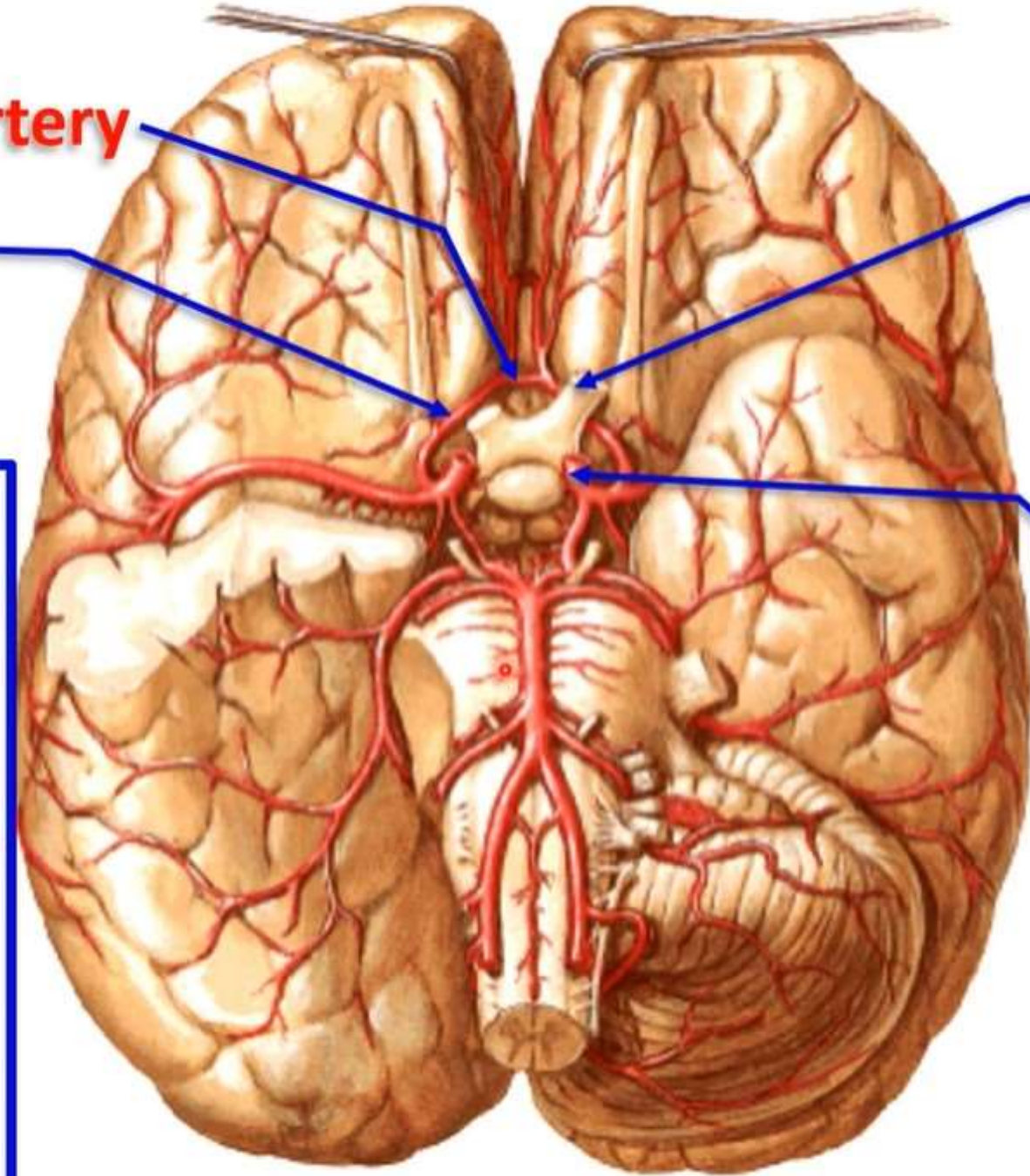
4th part of vertebral artery

Int carotid Artery

Superior cerebellar Artery

Anterior inferior cerebellar Artery

Posterior inferior cerebellar Artery

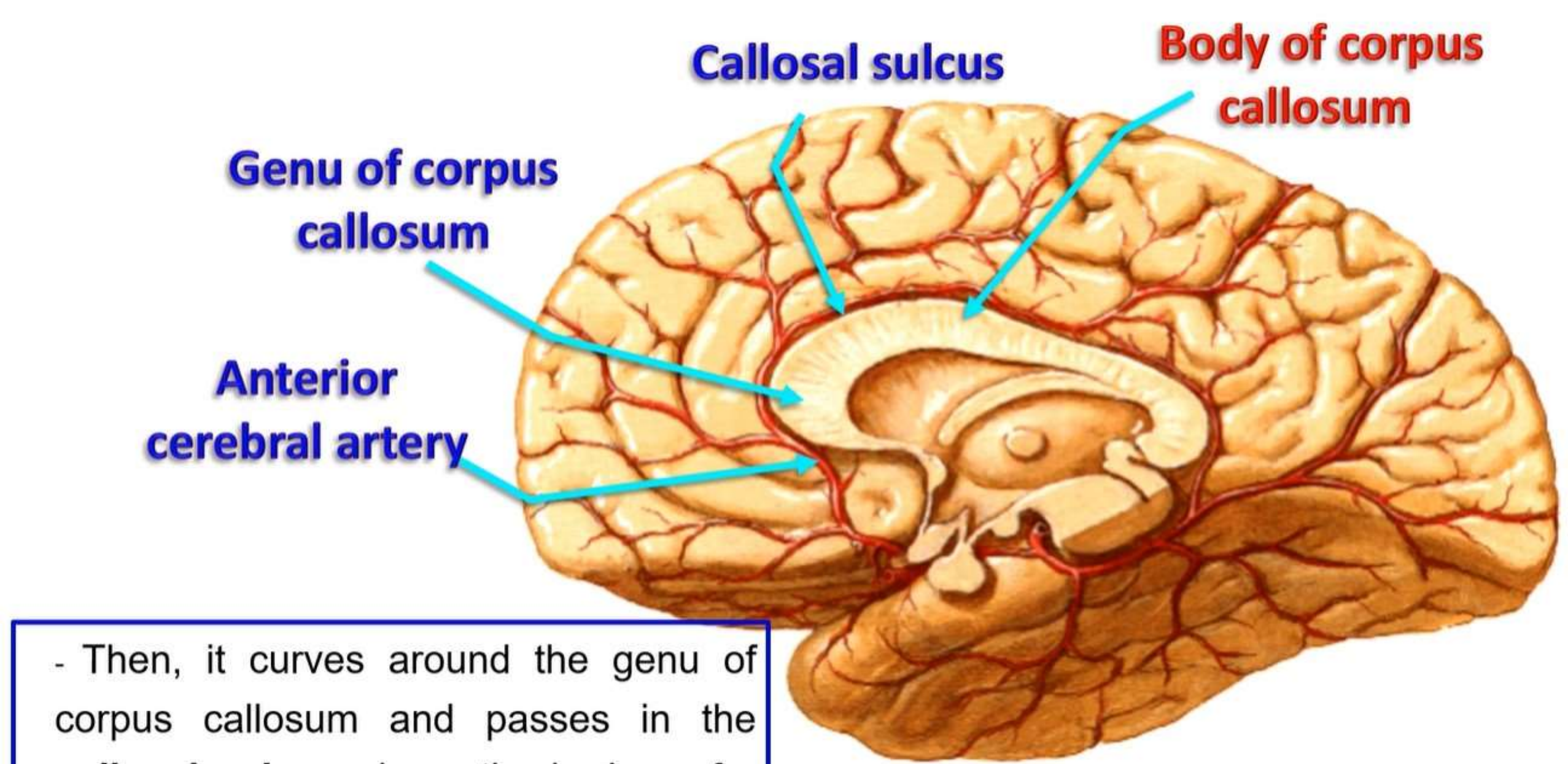


- **Anterior Cerebral Artery**

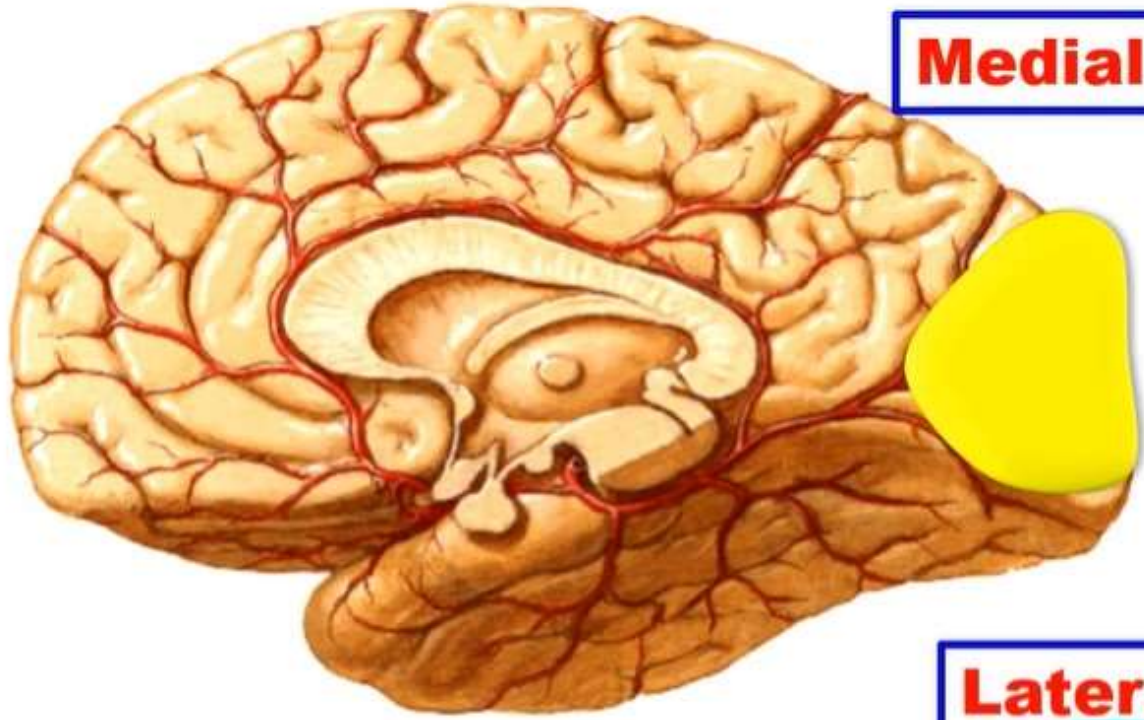
** **Origin:** one of 2 terminal branches of internal carotid artery.

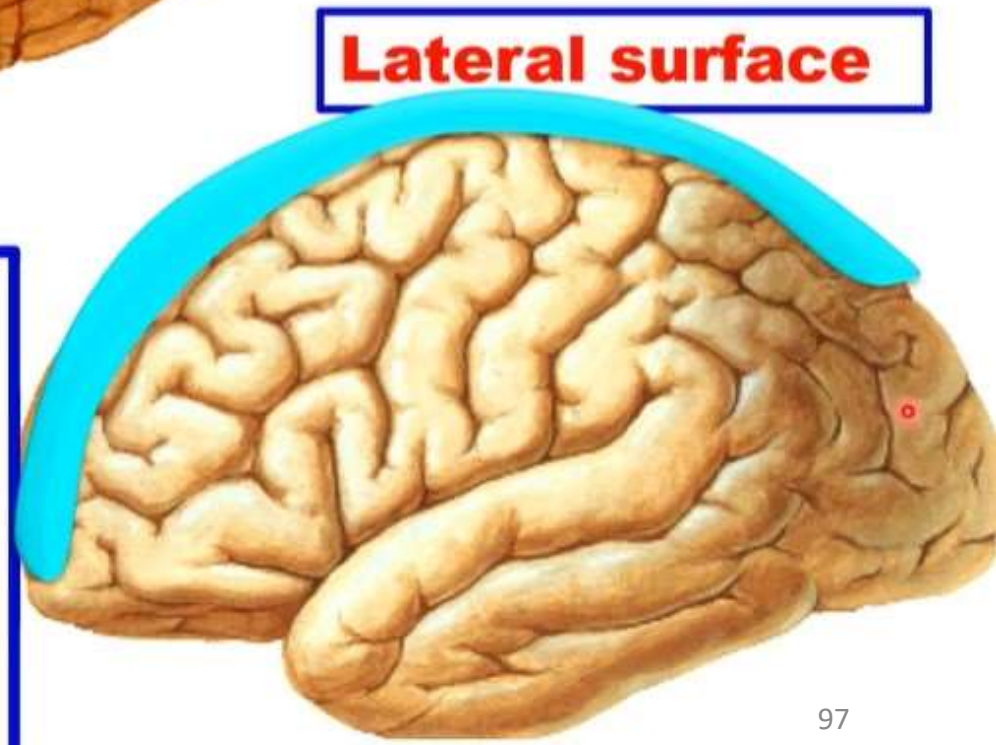
** **Course**:

- It passes medially above optic nerve to median longitudinal fissure.
- It communicates with the opposite side by anterior communicating artery.



- Then, it curves around the genu of corpus callosum and passes in the **callosal sulcus** above the body as far as the parieto-occipital sulcus.



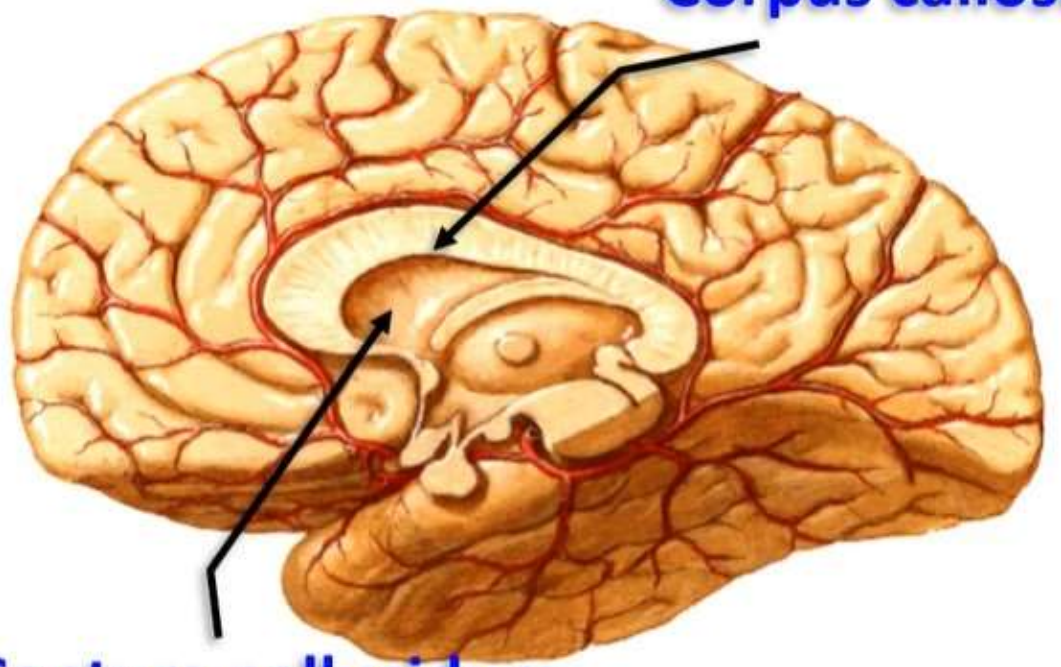


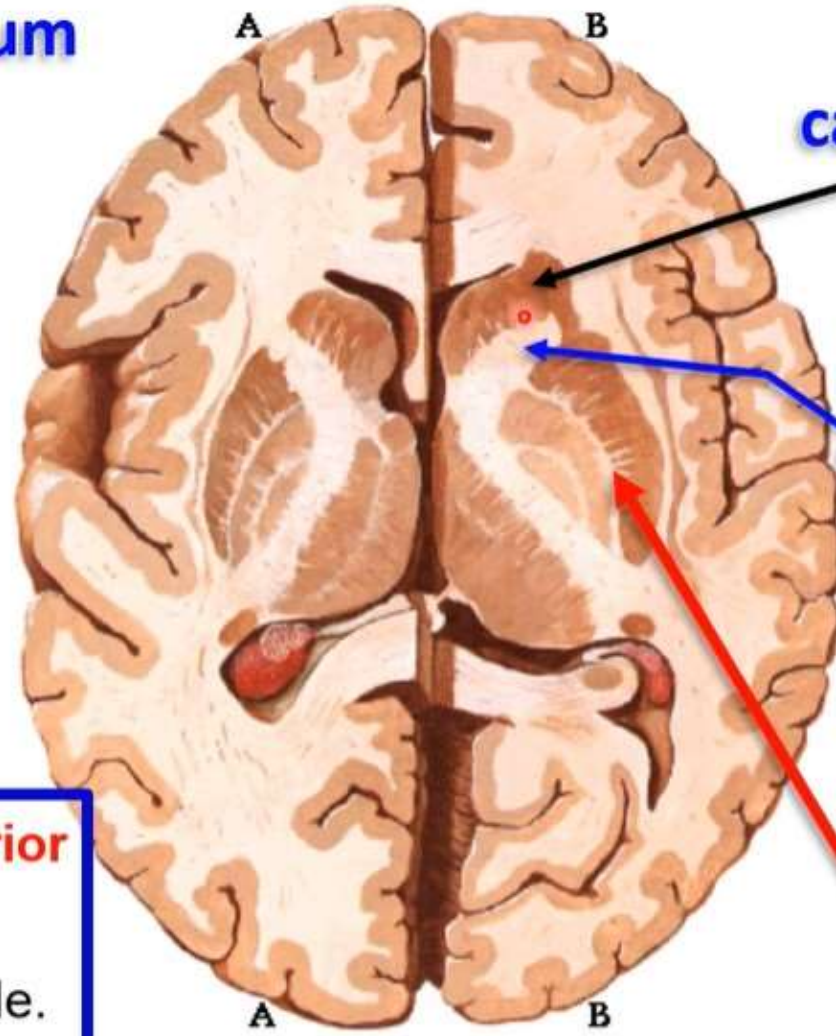
- **Cortical branches of anterior cerebral artery,**

a- Medial surface except the occipital lobe.

b- Upper inch of superolateral surface except the occipital lobe.

c- Medial part (1/3) of the orbital surface on the inferior surface.





Head of the caudate nucleus

Anterior limb of internal capsule

lentiform nucleus

- **Central branches; pass through the anterior perforated substance to supply**

1- Anterior part of anterior limb of internal capsule.

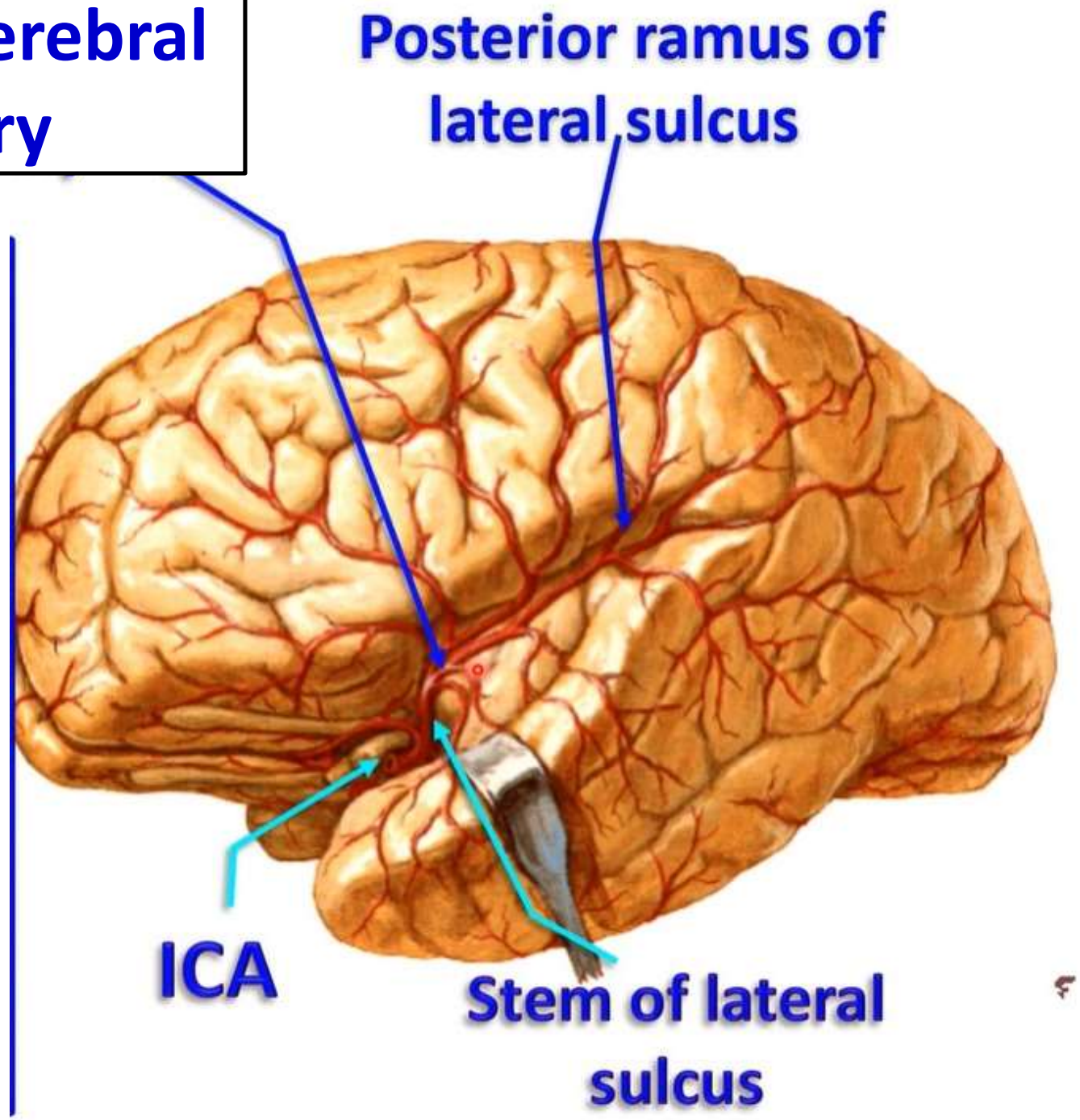
2- Head of caudate nucleus.

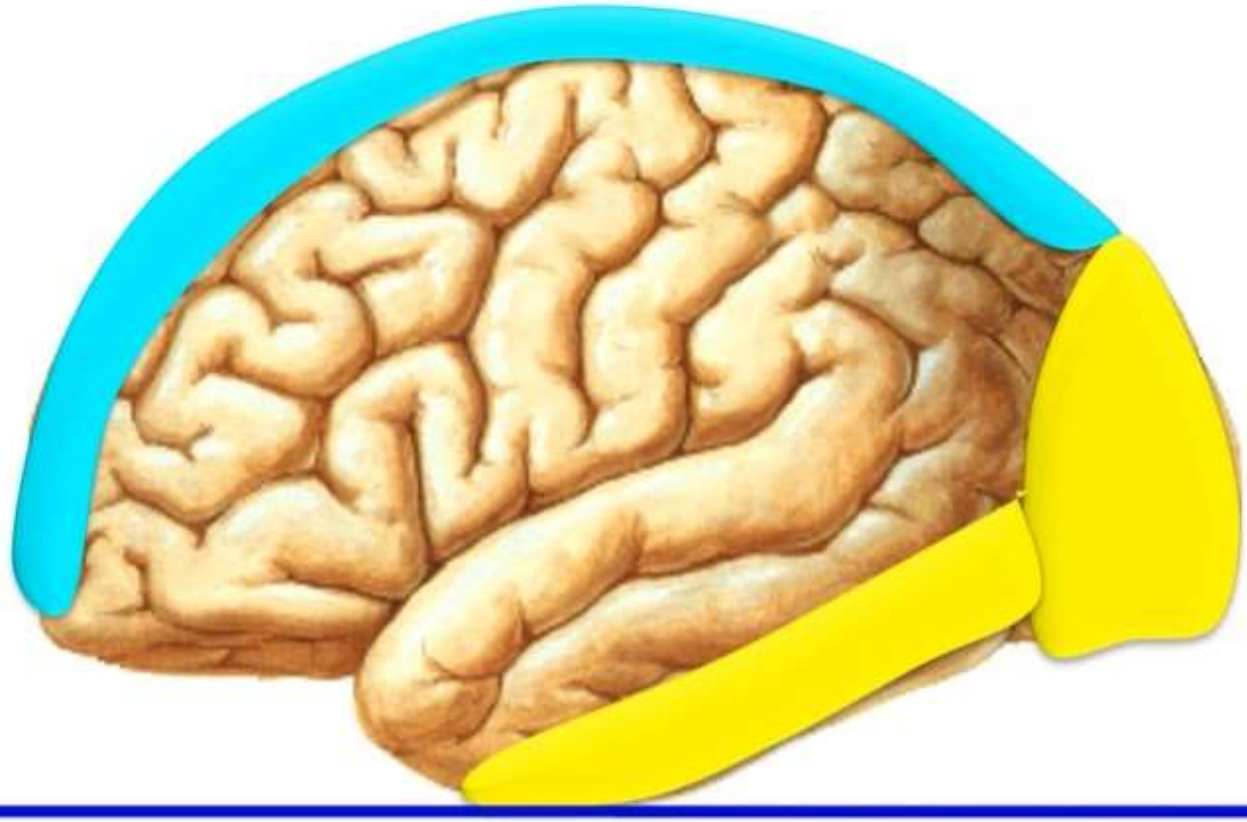
3- Lentiforrn nucleus.

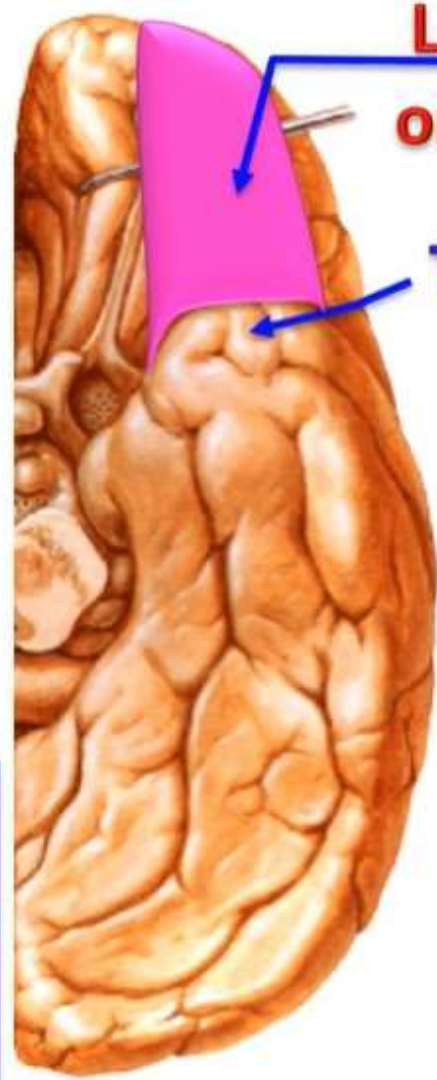
4- Corpus callosum except splenium.

5- Septum pellucidum.

Middle cerebral artery







- **Cortical branches of middle cerebral artery**

1- Superolateral surface including the insula **except**;

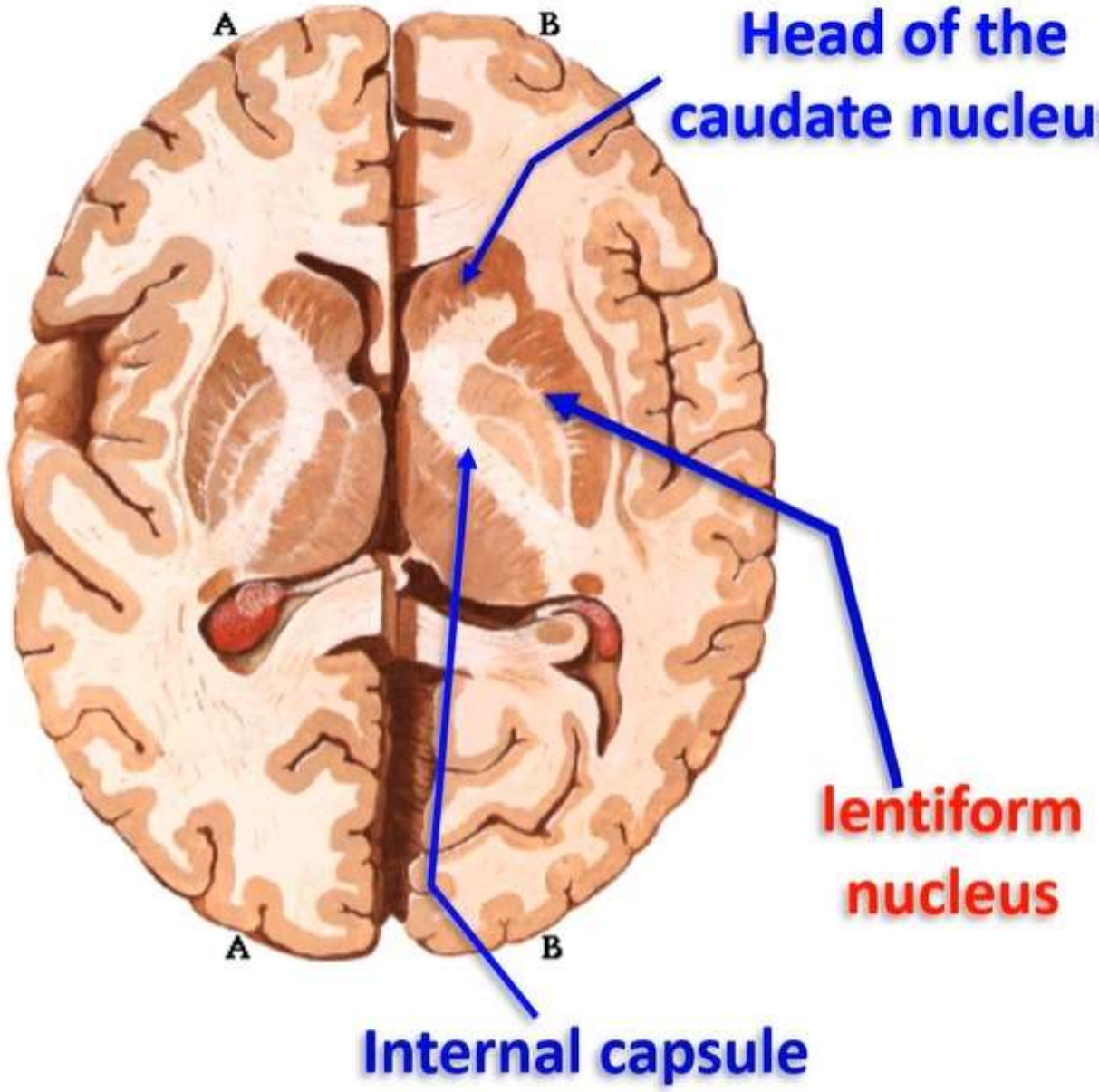
a- Upper inch (supplied by the anterior cerebral artery).

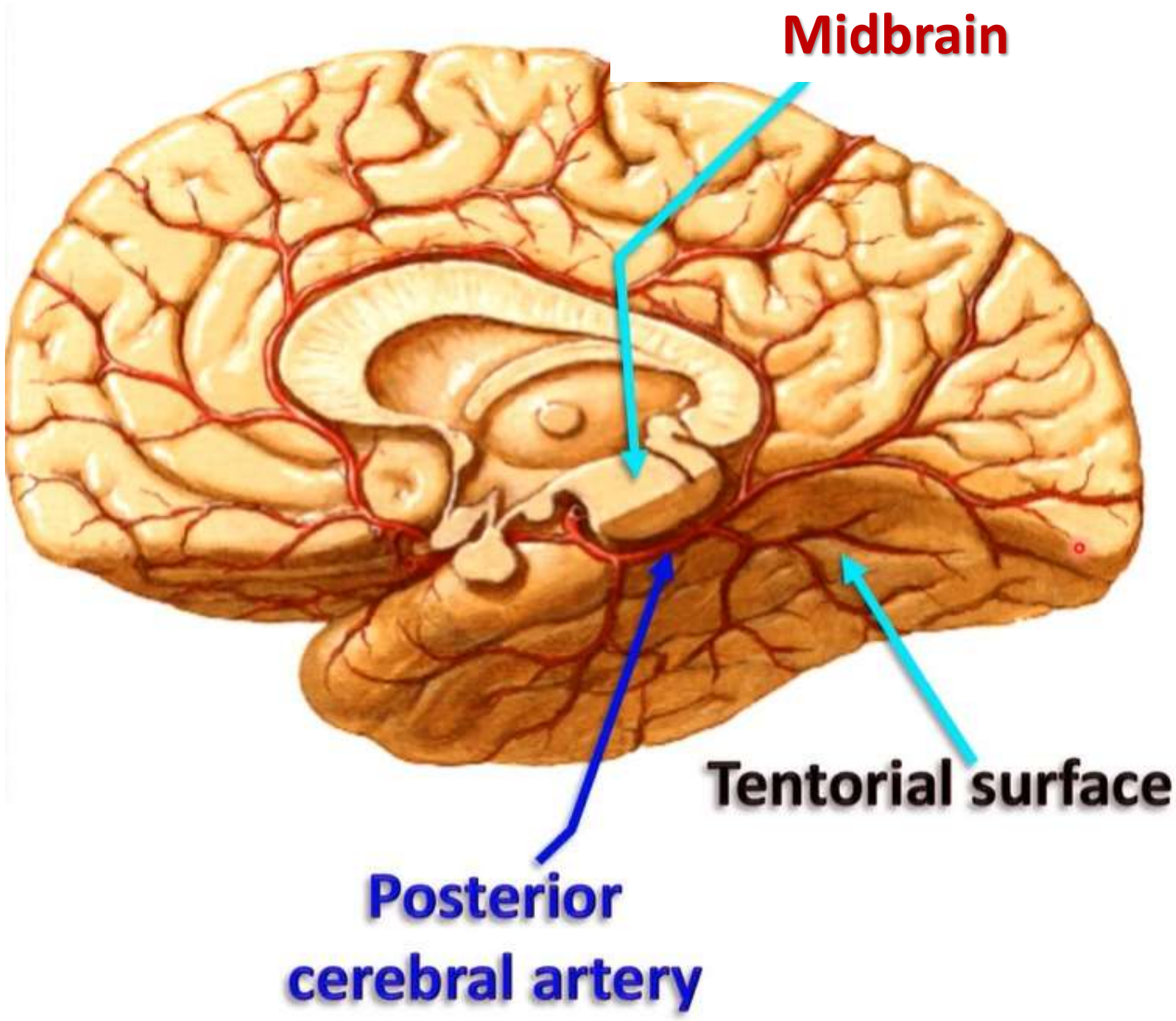
b- Lower inch along inferior border (by posterior cerebral artery).

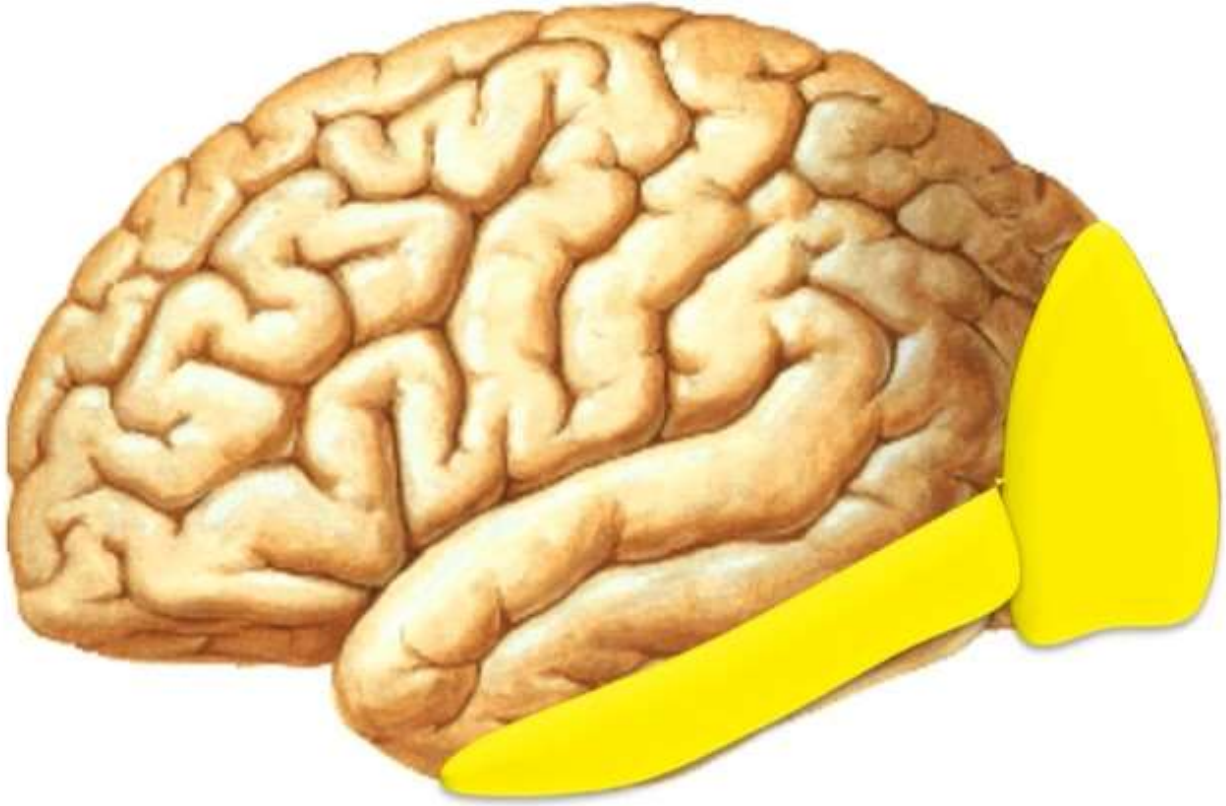
c- Occipital lobe {supplied by the posterior cerebral artery).

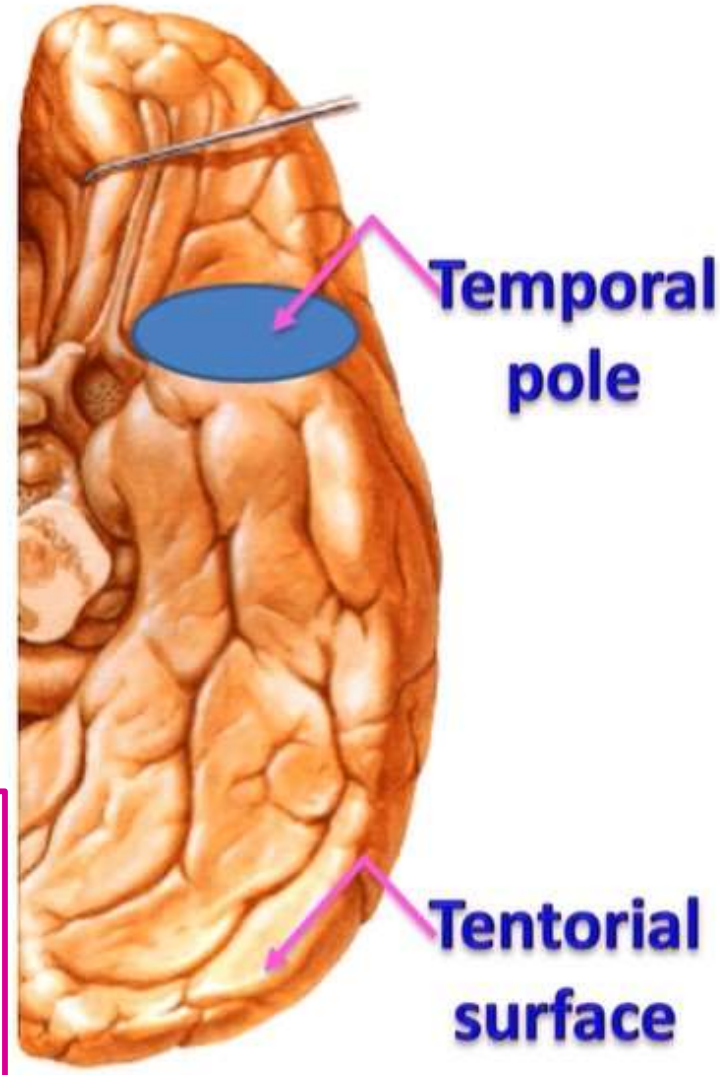
2- Lateral part (2/3) of the orbital surface of the **inferior surface**.

3- Temporal pole.


A
B
A
B
Head of the caudate nucleus
lentiform nucleus
Internal capsule


Cerebral peduncle of Midbrain
Tentorial surface
Posterior cerebral artery



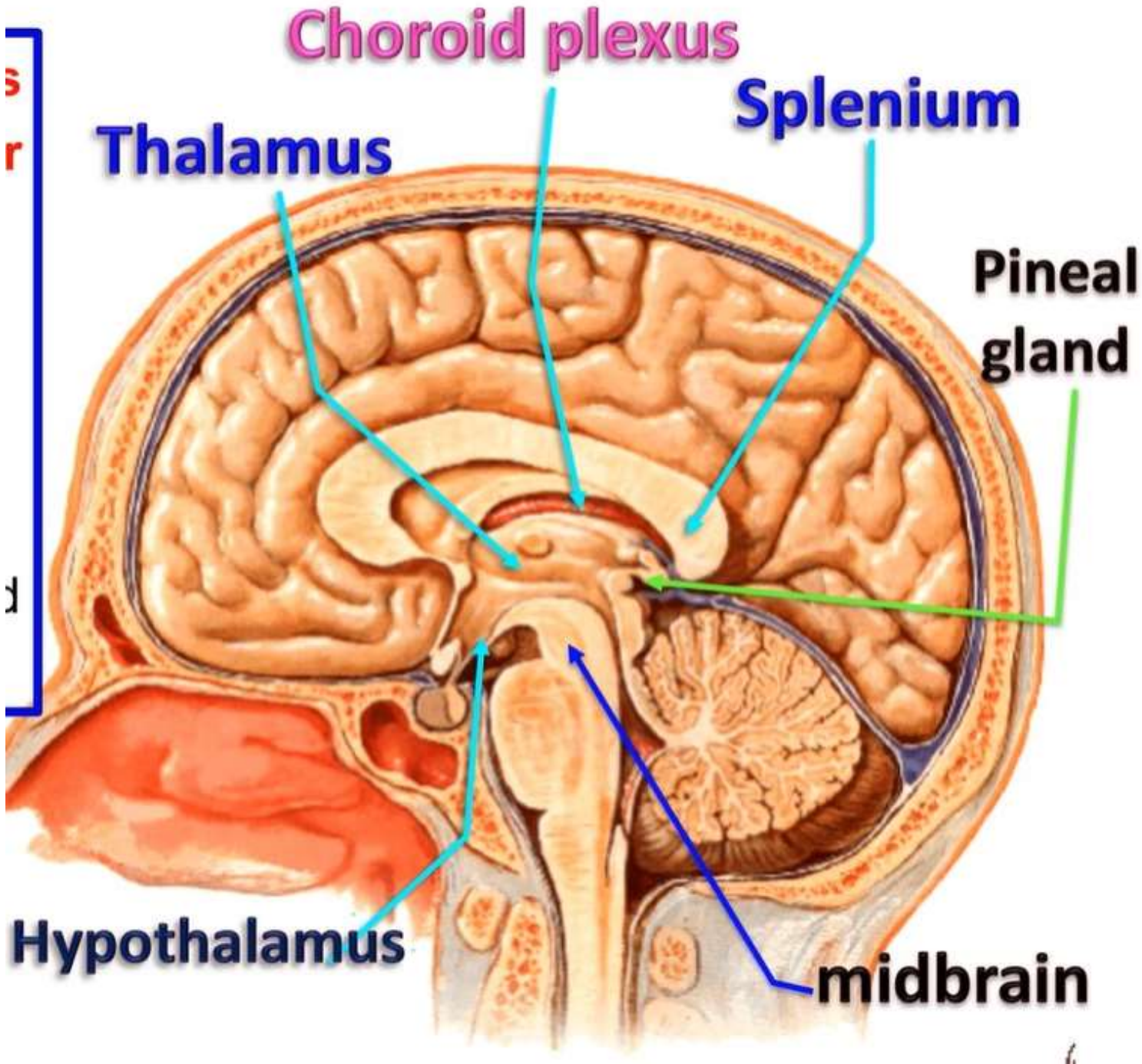


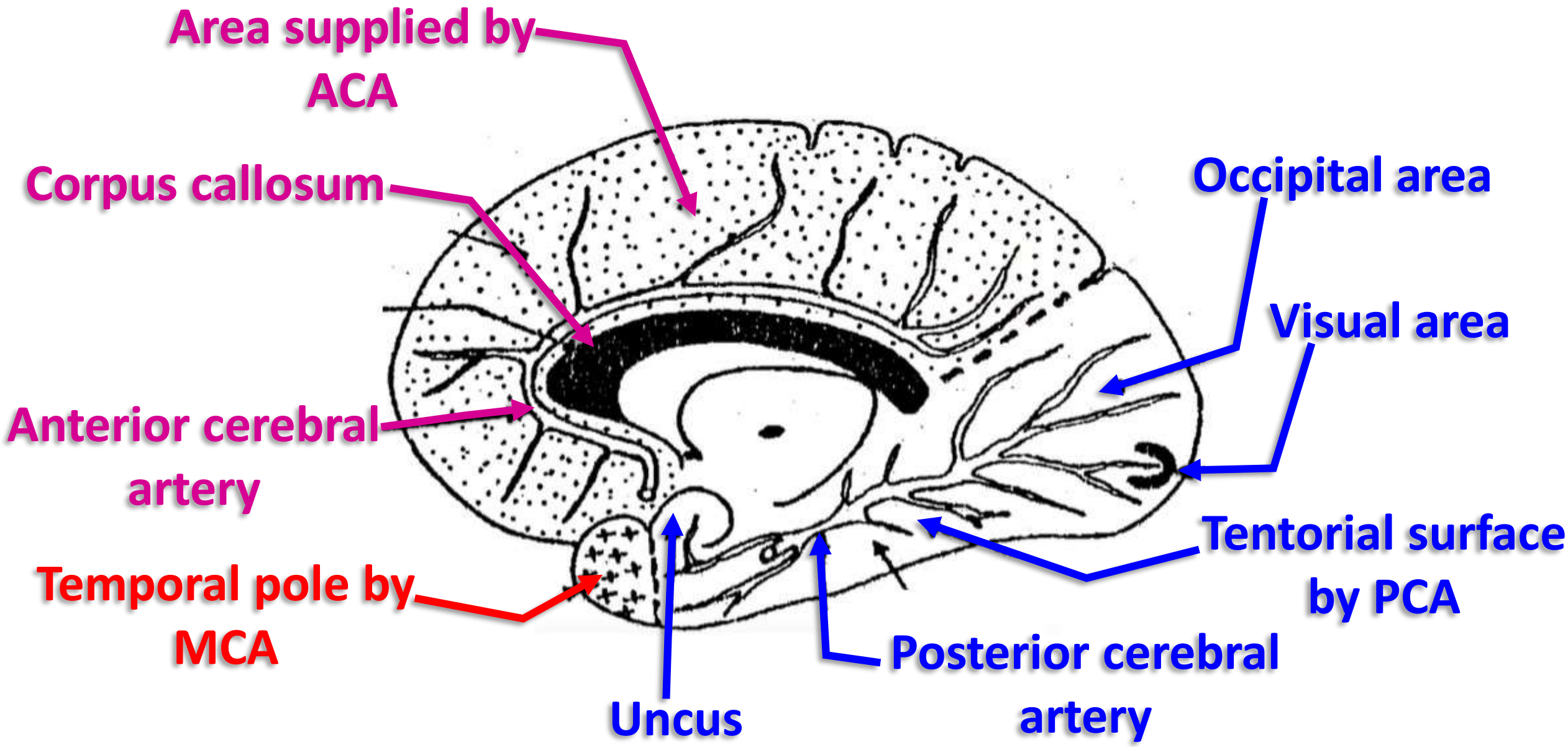
Cortical branches of Posterior cerebral artery

1- Tentorial surface of the cerebral hemisphere **except** temporal pole.

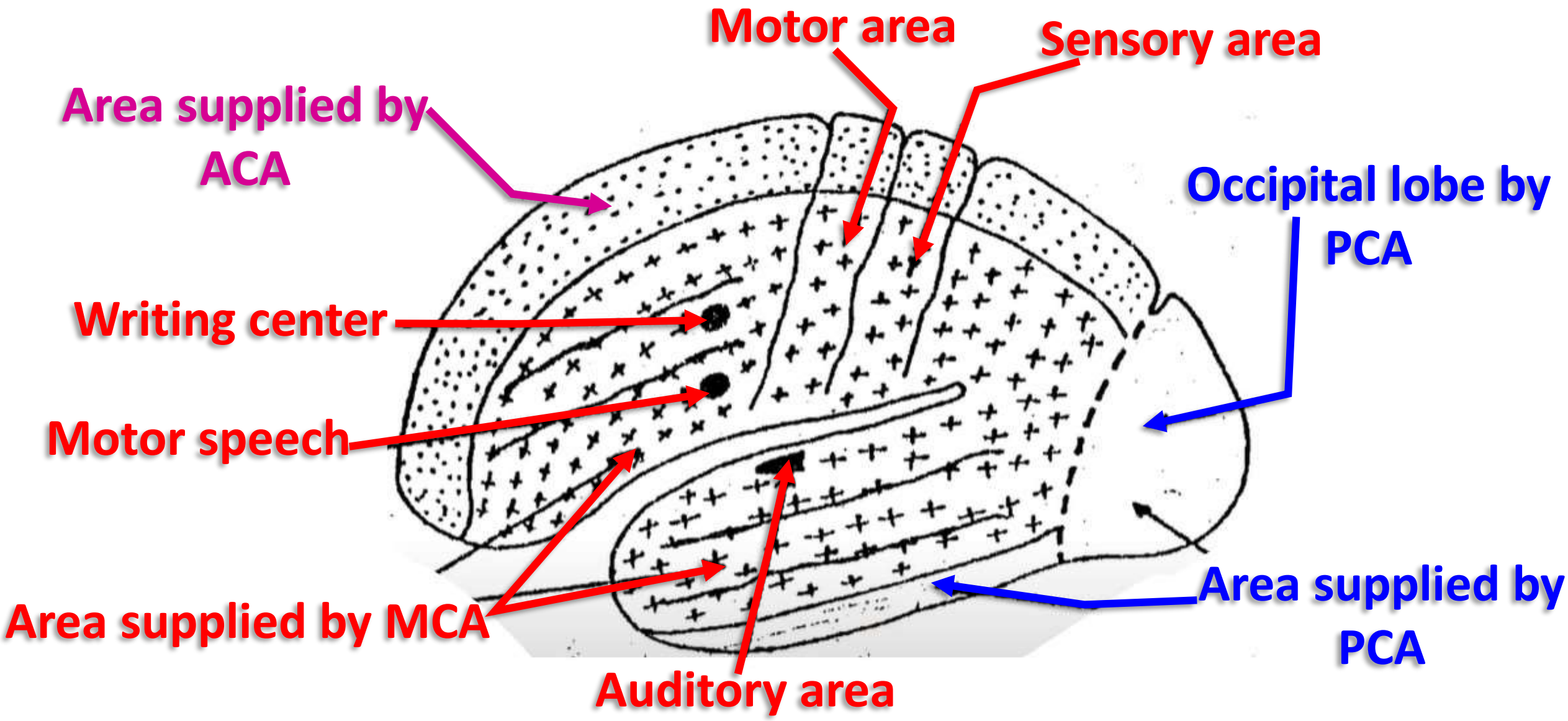
2- One finger breadth on the superolateral surface along the inferior border.

3- All surfaces of the occipital lobe (**visual center**)

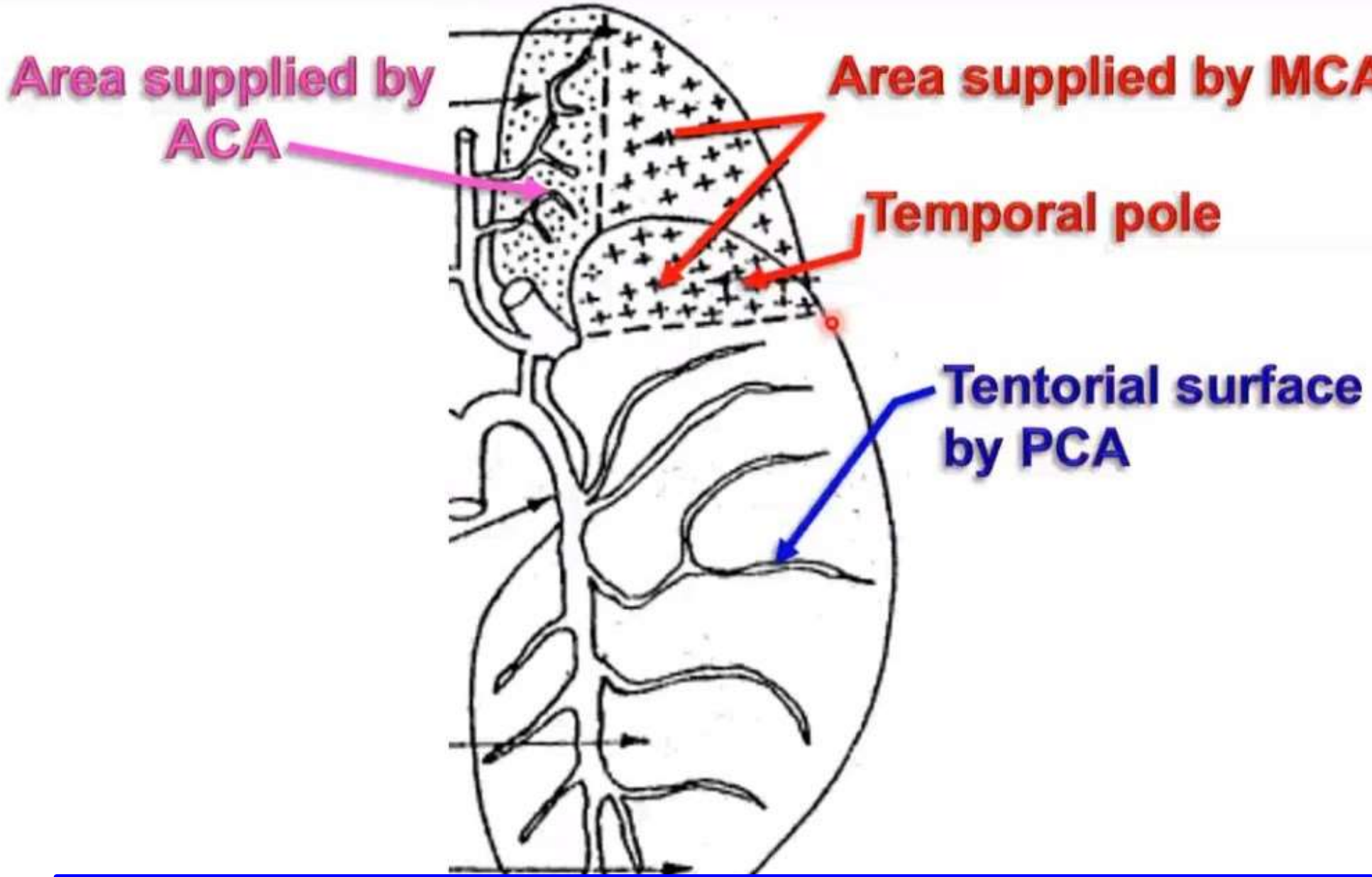

Choroid plexus
Splenium
Thalamus
Pineal
gland
Hypothalamus
midbrain



Medial surface of right cerebral hemisphere

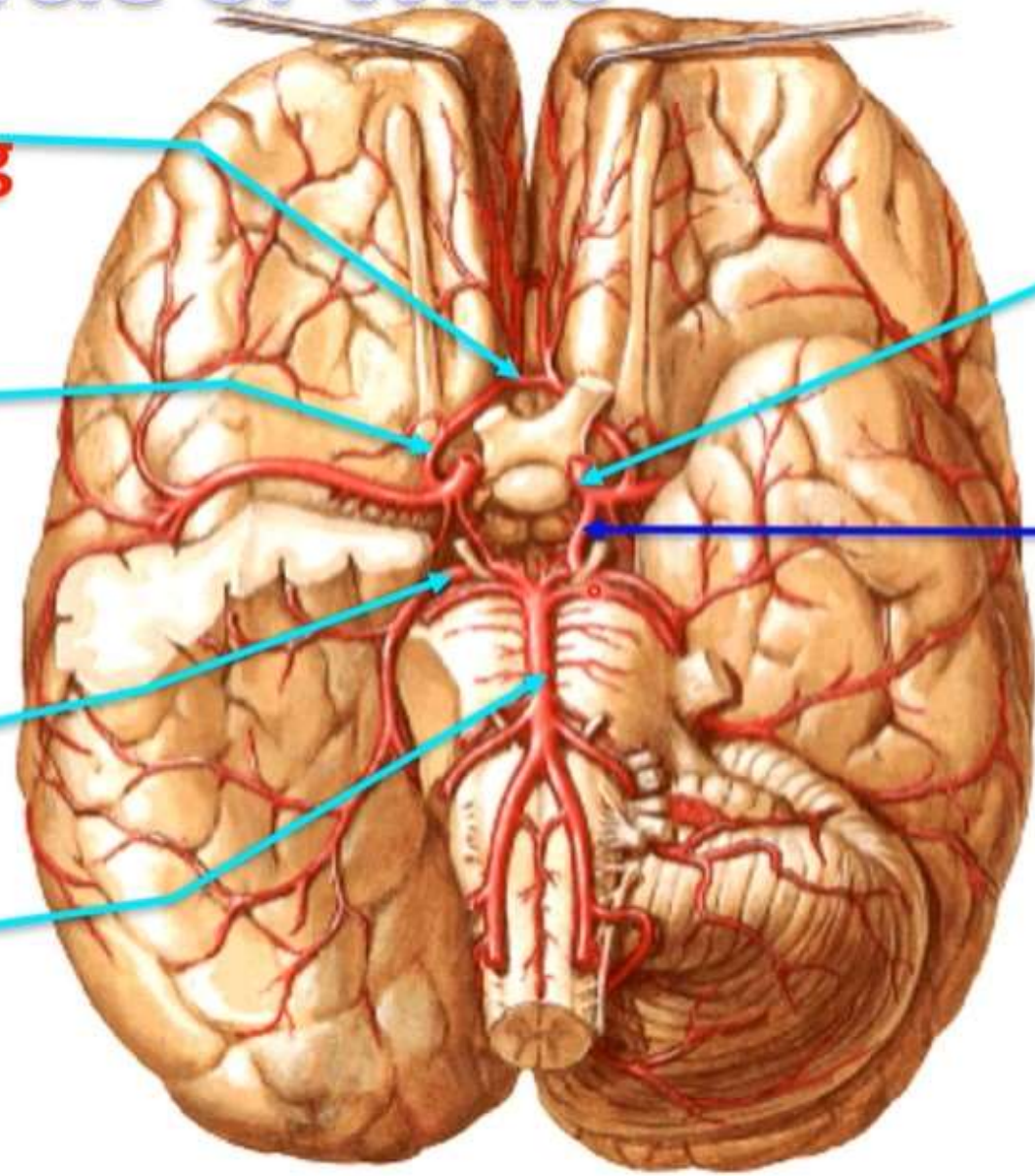


Suprolateral surface of left cerebral hemisphere



Inferior surface of left cerebral hemisphere

Circle of Willis



Ant. communicating Artery

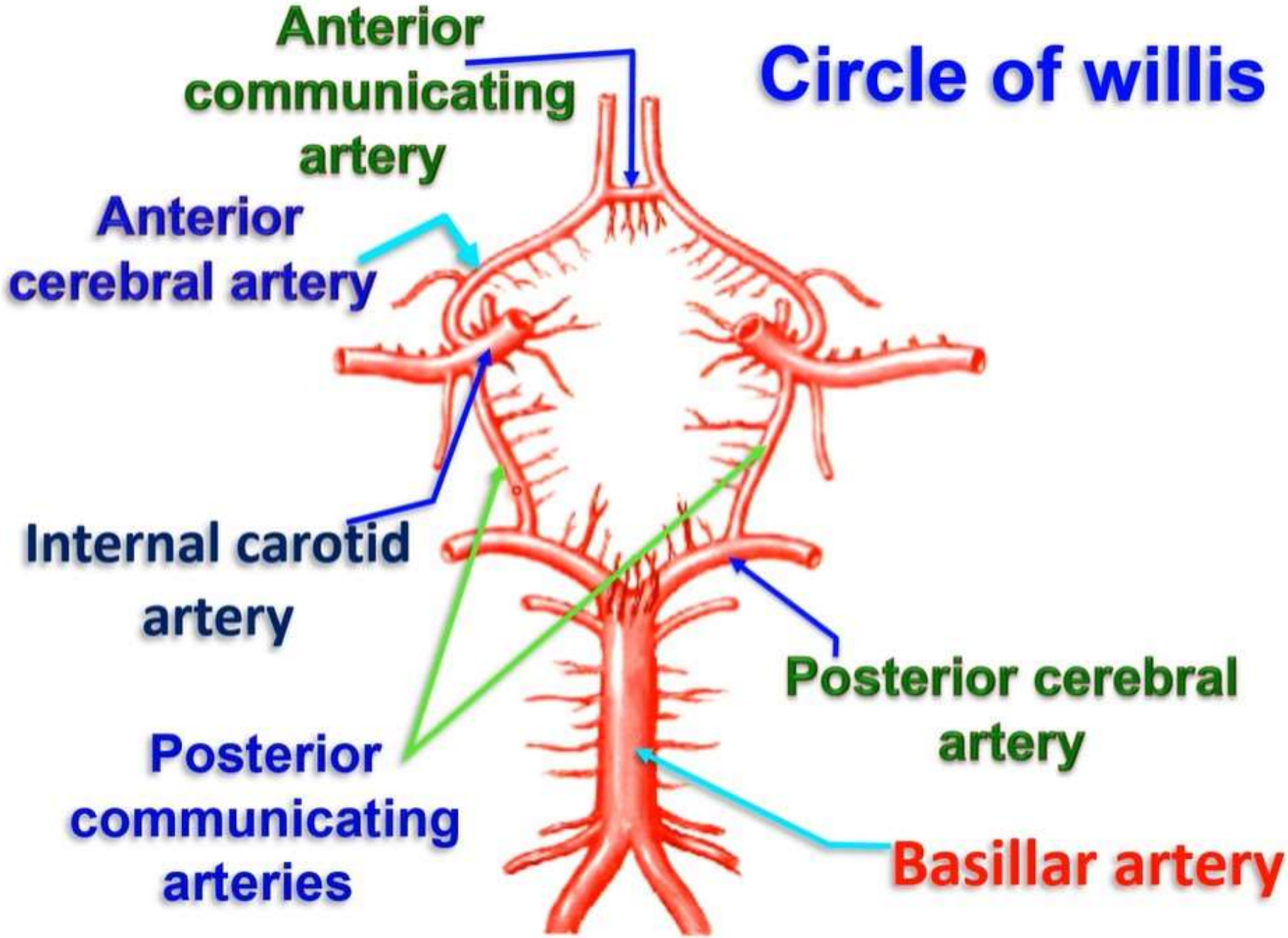
Ant. cerebral Artery

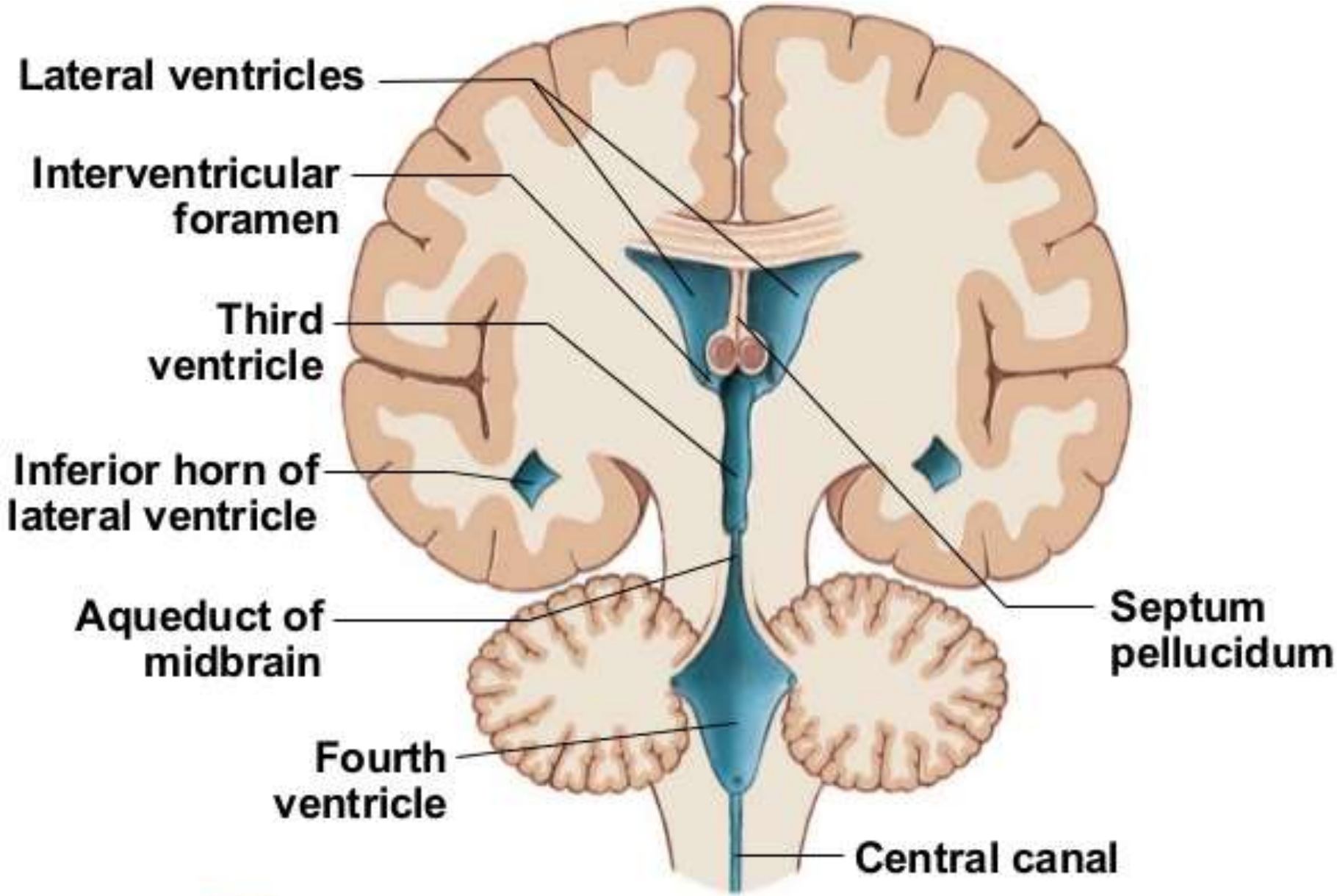
Post. cerebral Artery

Basilar Artery

Int carotid Artery

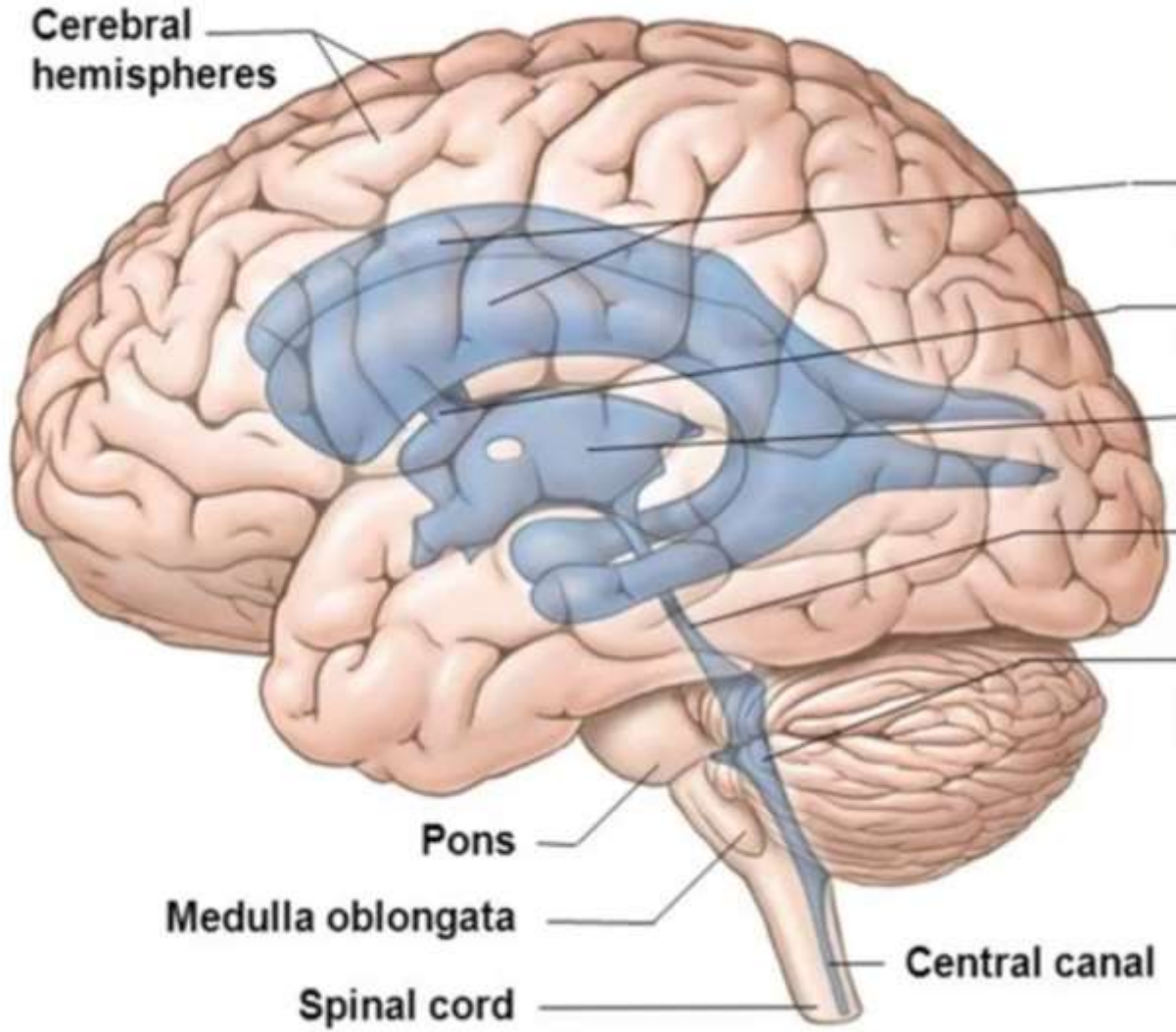
Post. Communicating artery


Circle of willis
Anterior communicating artery
Anterior cerebral artery
Internal carotid artery
Posterior communicating arteries
Posterior cerebral artery
Basillar artery



d Diagrammatic coronal section showing the interconnections between the ventricles

Ventricular system (lateral view)



Ventricles of the Brain
Lateral ventricle
Interventricular foramen
Third ventricle
Aqueduct of midbrain
Fourth ventricle

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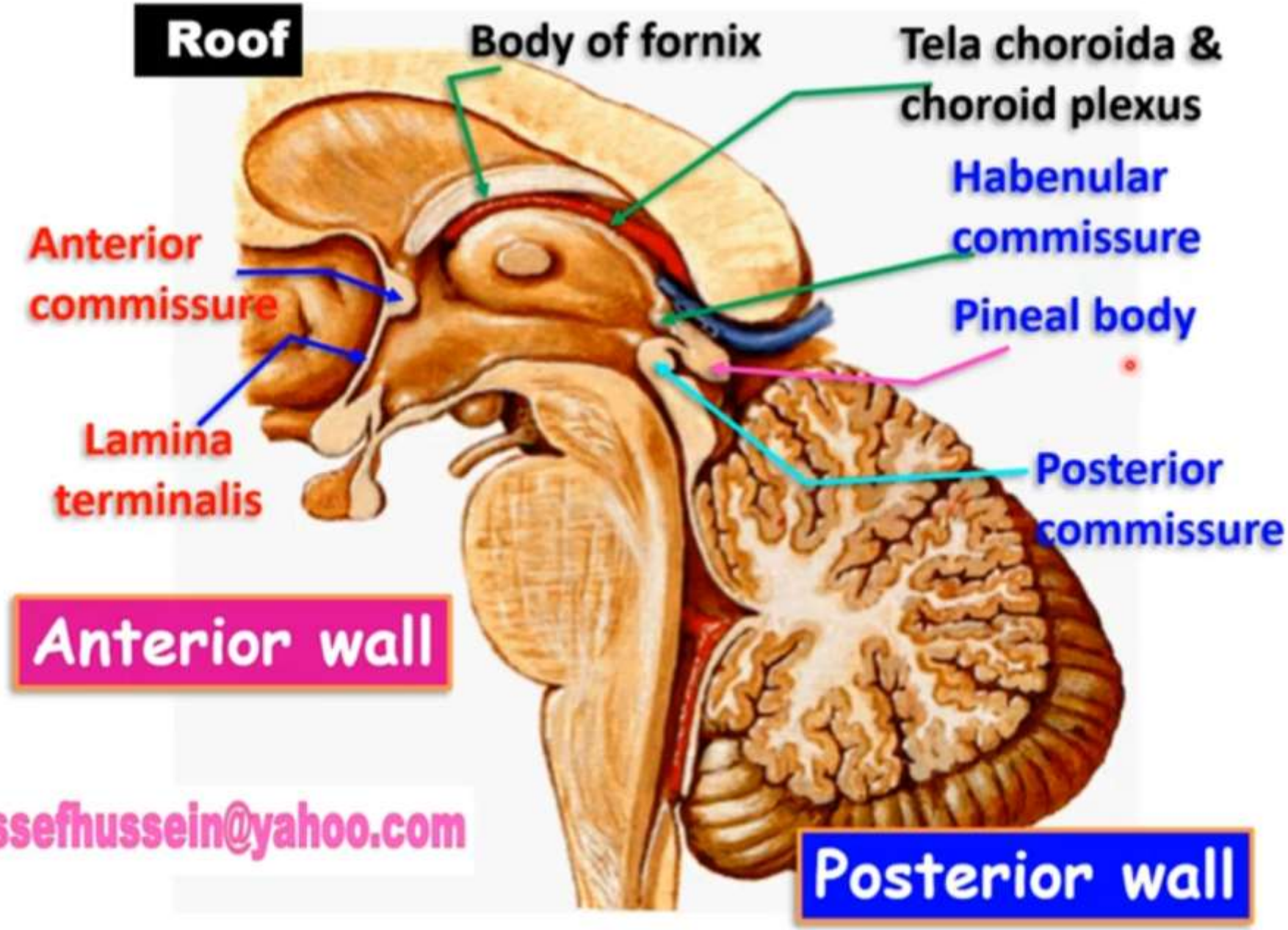

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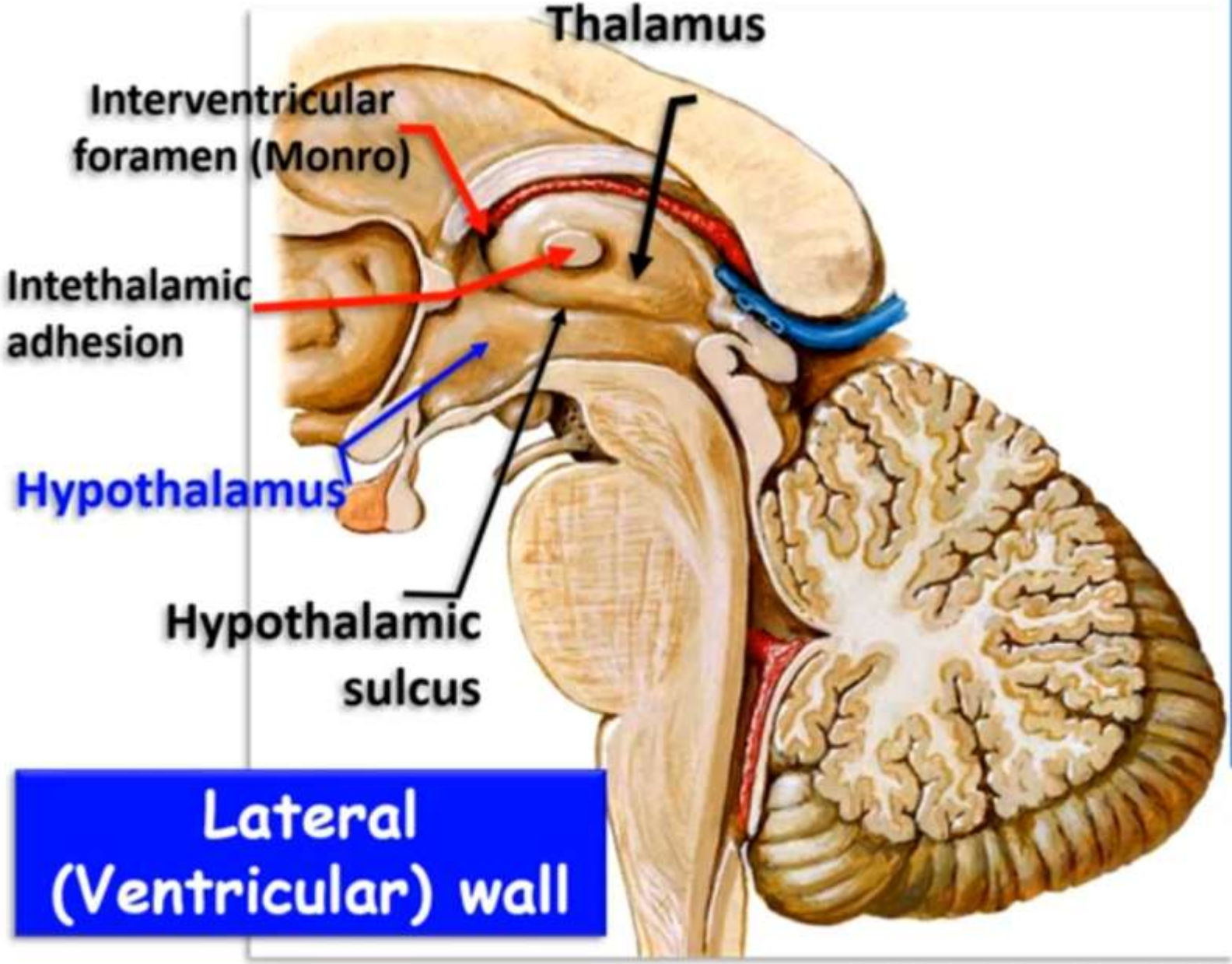

Lateral (Ventricular) wall

Lateral wall; if formed by;

- Upper part; Thalamus.
- Middle part; hypothalamic sulcus.
-Lower part; hypothalamus.
- Interventricular foramen (foramen of Monro) in the anterior part.

N.B; The two lateral walls are interconnected by the interthalamic adhesion across the cavity of the 3rd ventricle

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Floor

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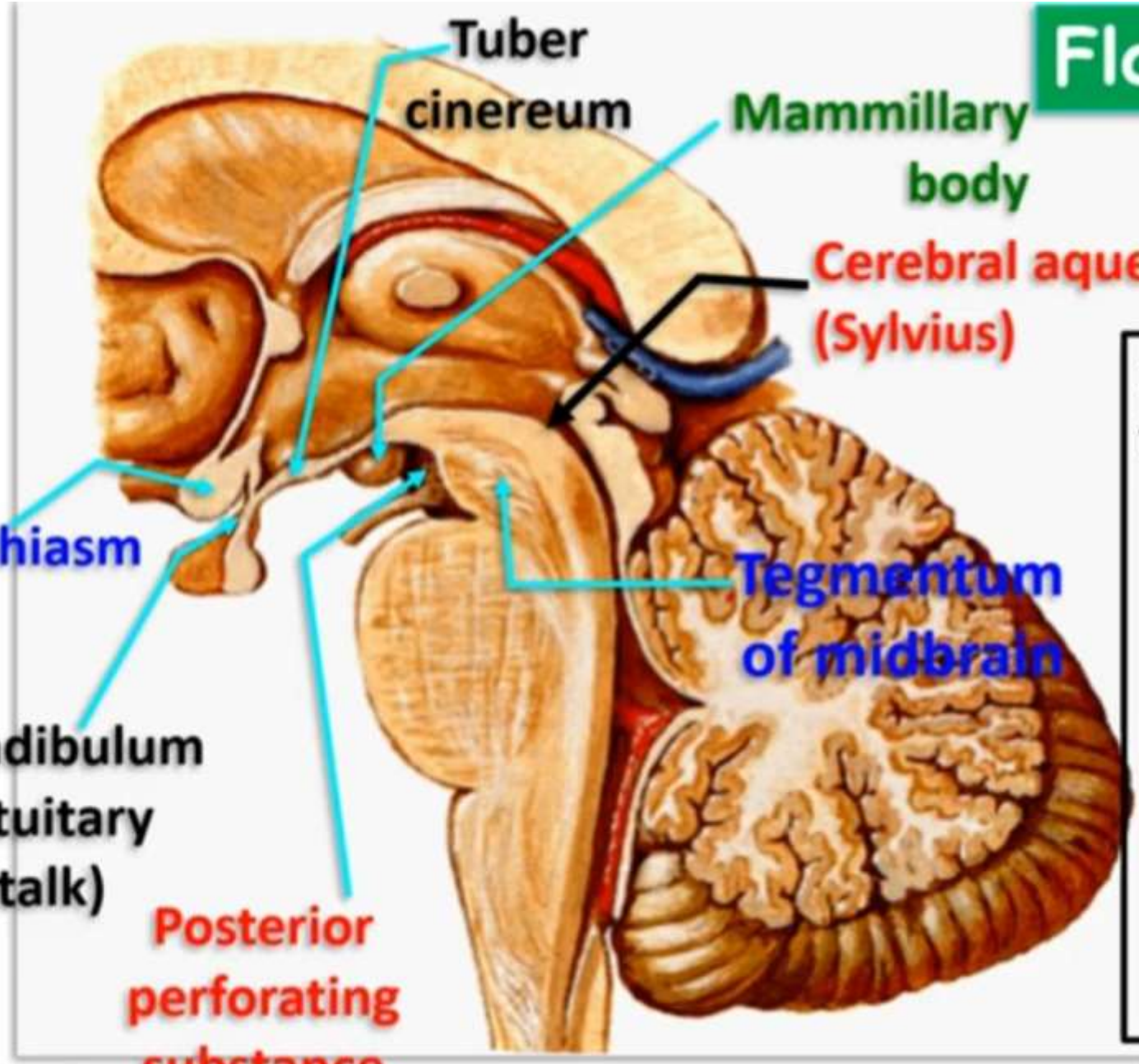

Floor: following structures arranged from before backward;

1- Optic chiasma.
2- Infundibulum.
3- Tuber cinereum.
4- Mammaillary bodies.
5- Posterior perforated substance.
6- Tegmentum of the midbrain.
7- Cerebral aqueduct of the midbrain.

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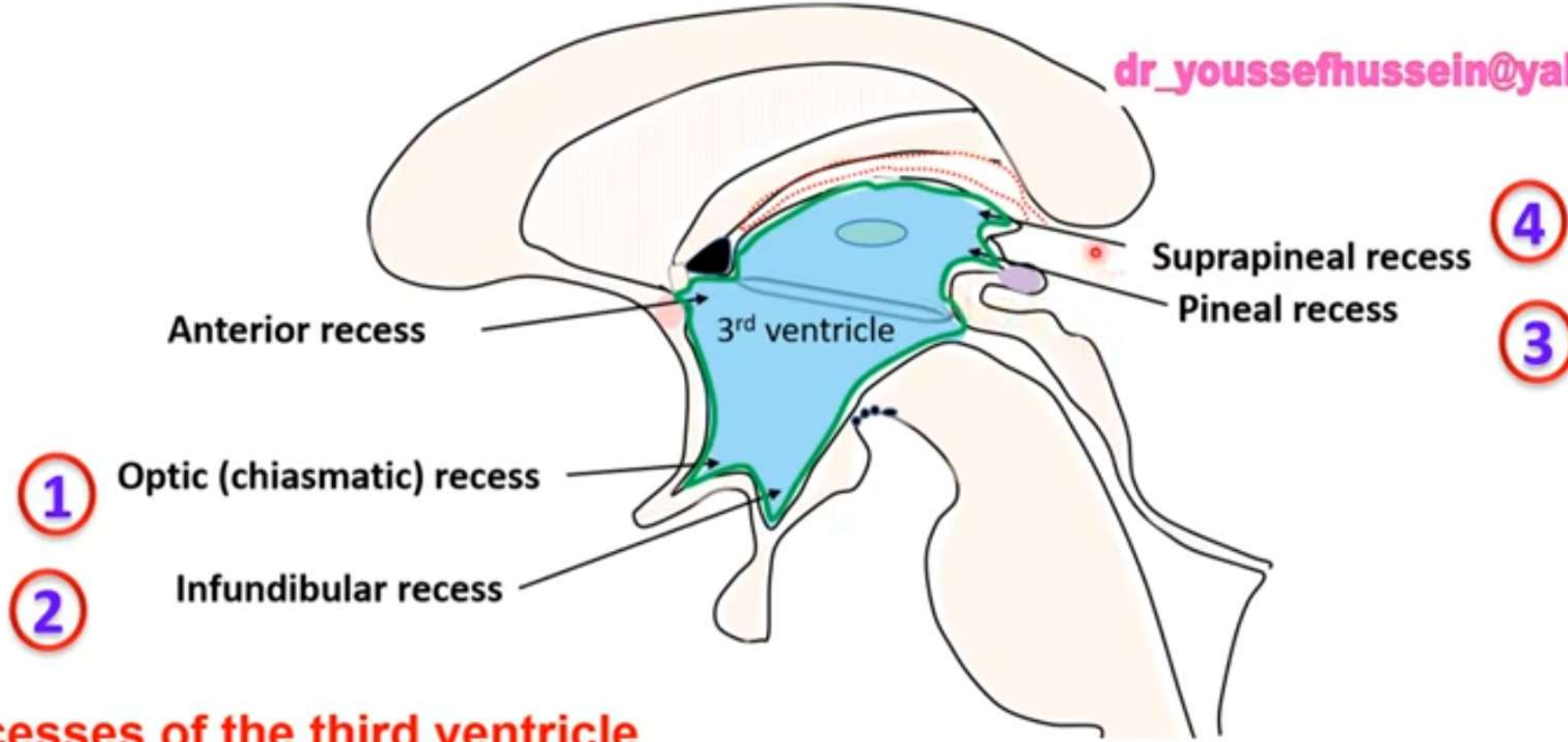


- **Recesses of the third ventricle**

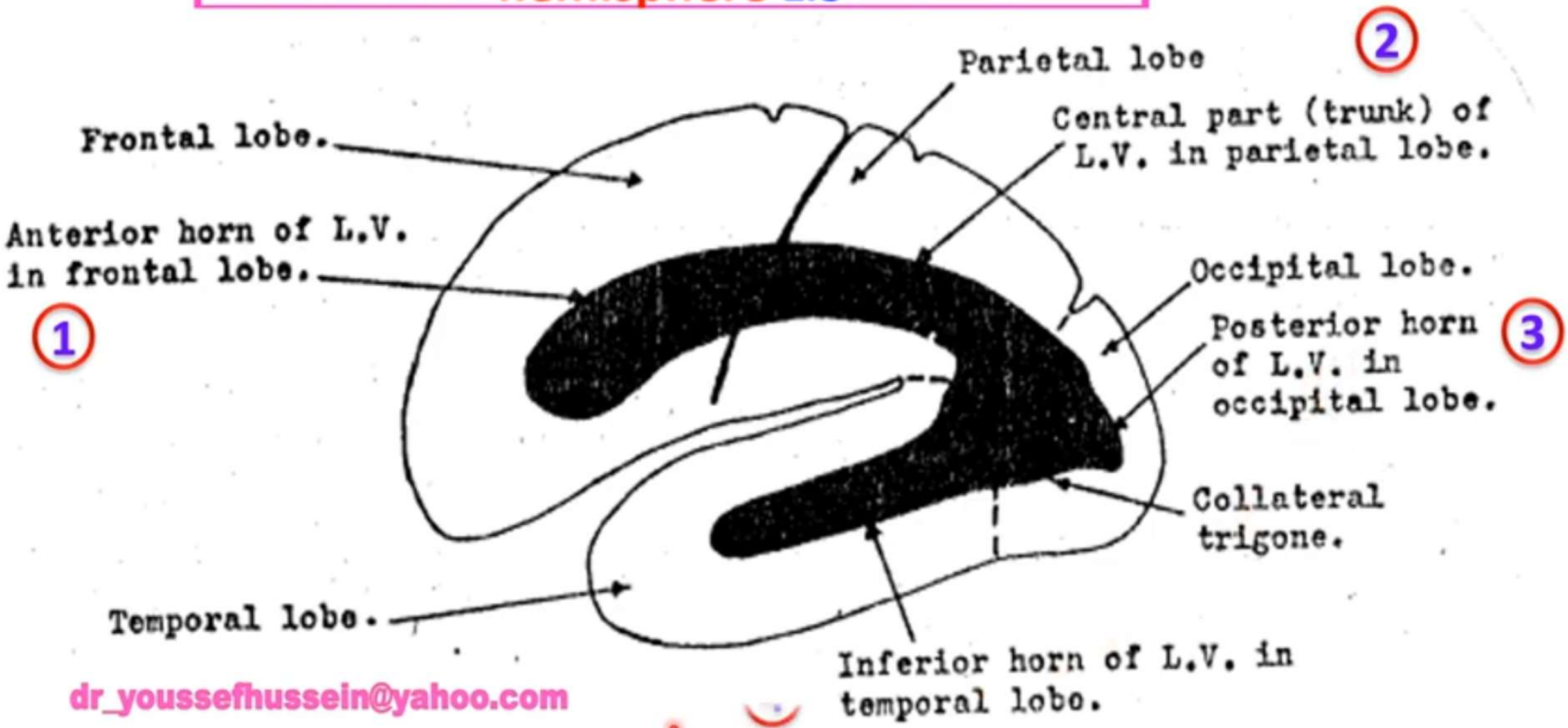
1- Supraoptic recess; above the optic chiasma.

2- Infundibular recess; into the upper part of the infundibulum.

3- Pineal recess; into the pineal stalk.

4- Suprapineal recess; above the pineal stalk.

Lateral Ventricle in the left cerebral hemisphere L.S



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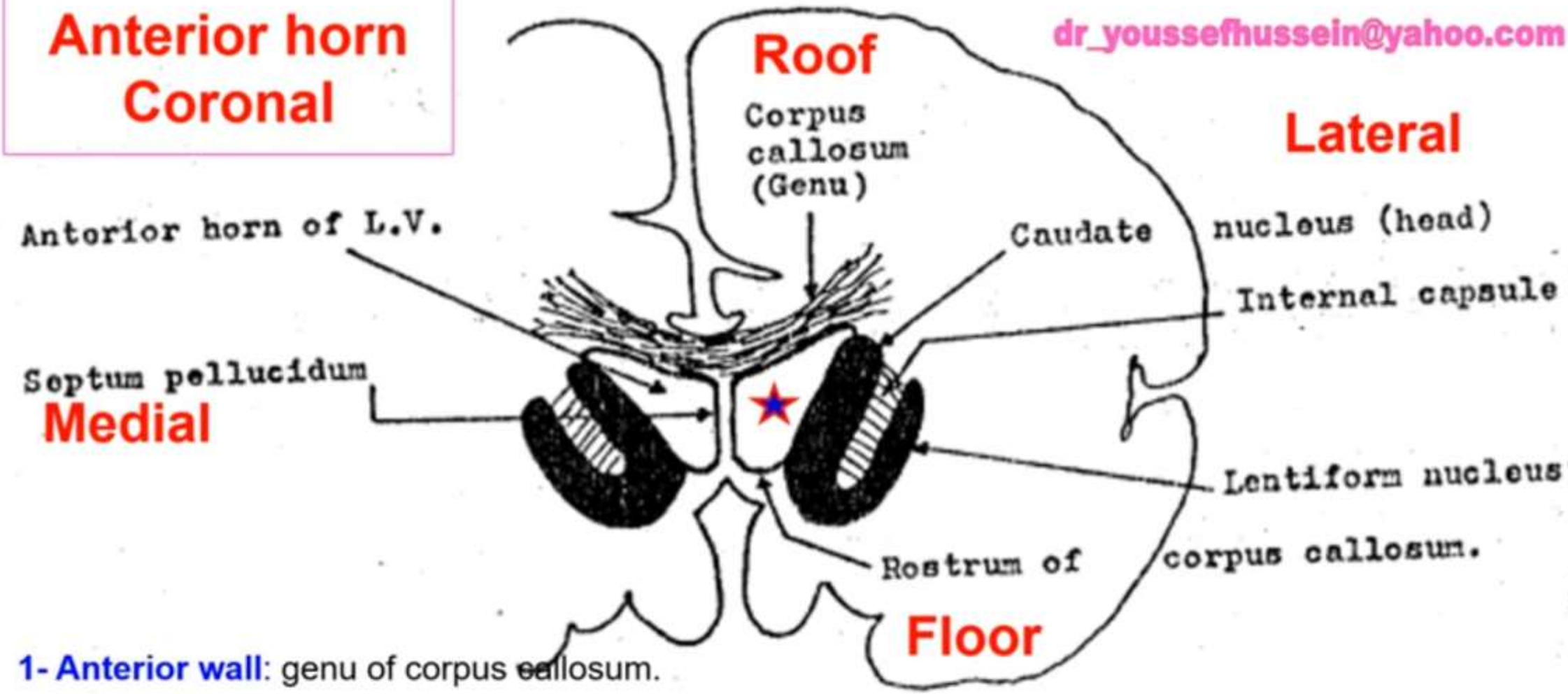
Anterior horn
Coronal

dr_youssefhussein@yahoo.com



1- **Anterior wall**: genu of corpus callosum.

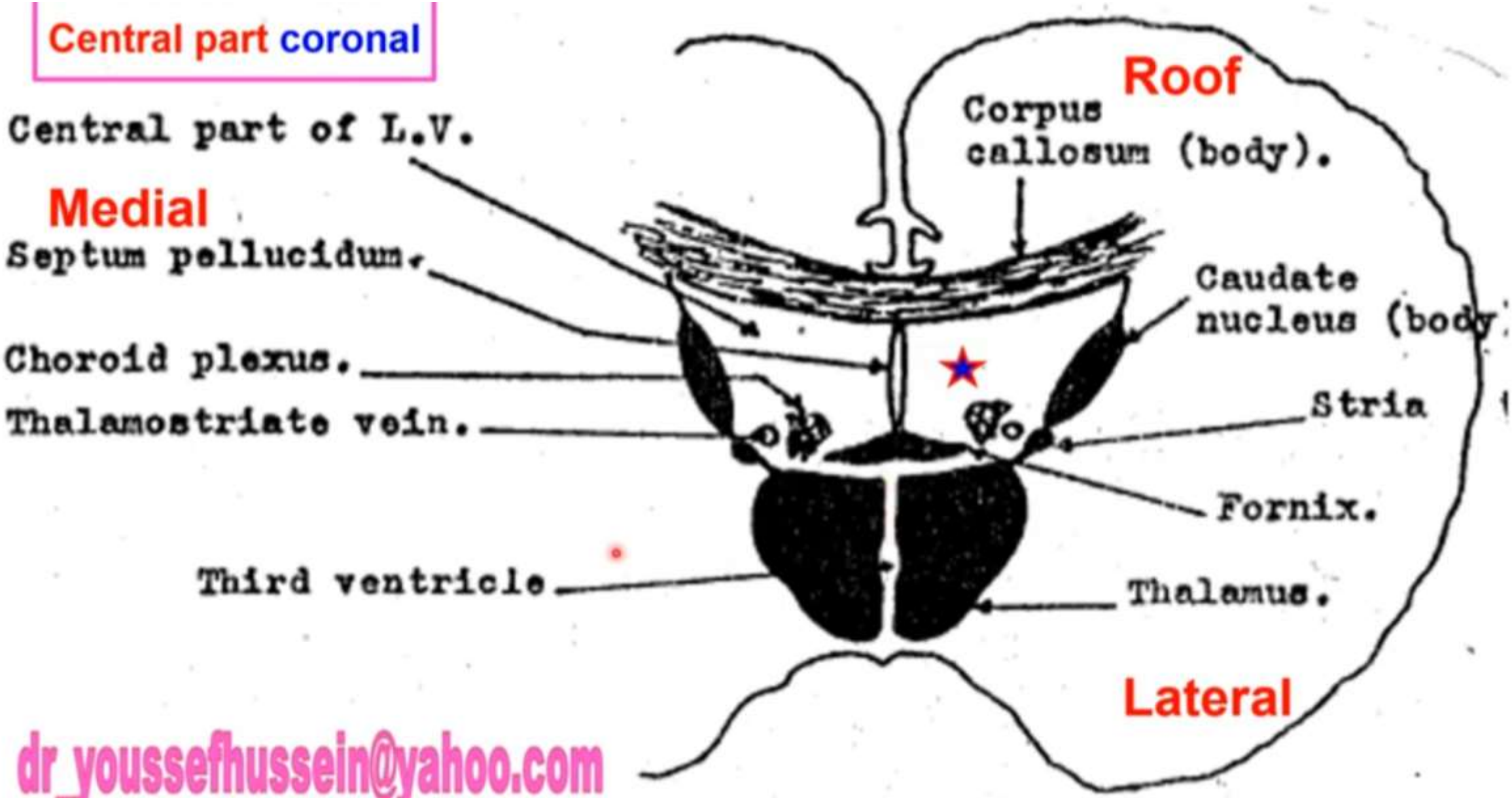
2- **Roof**; genu of corpus callosum.

3- **Floor**; rostrum of corpus callosum.

4- **Medial wall**; septum pellucidum.

5- **Lateral wall**: head of caudate nucleus separated from lentiform by internal capsule.

Central part coronal



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Posterior Horn coronal

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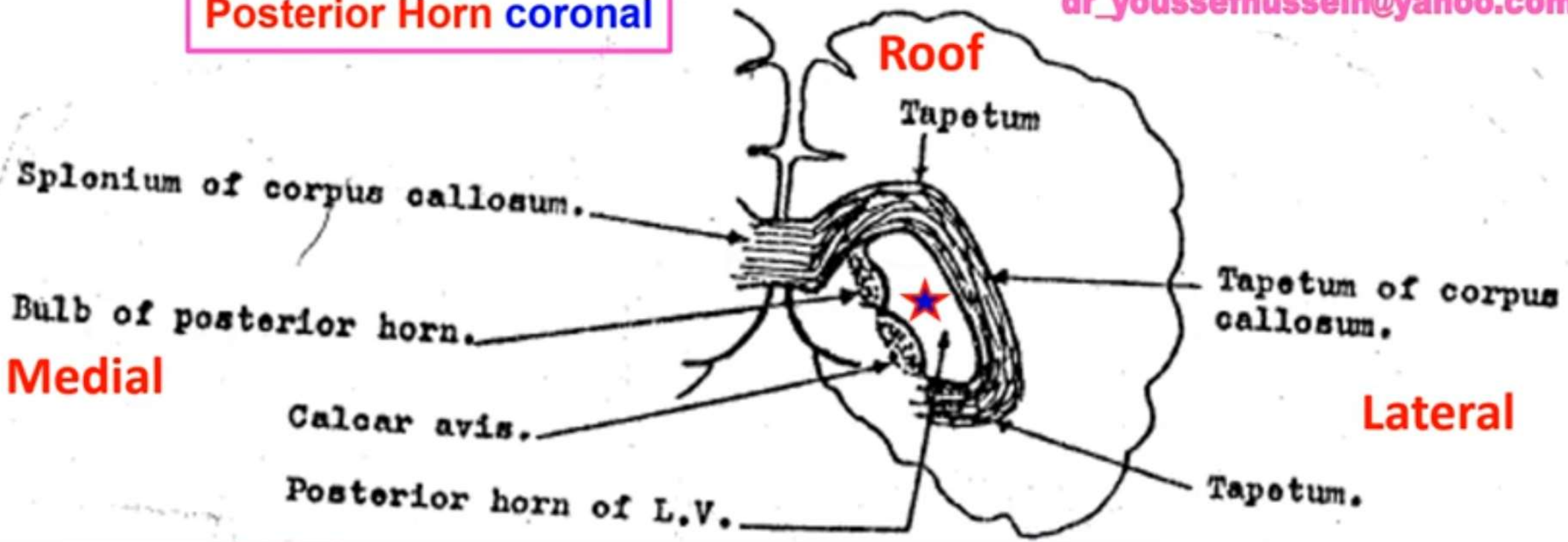


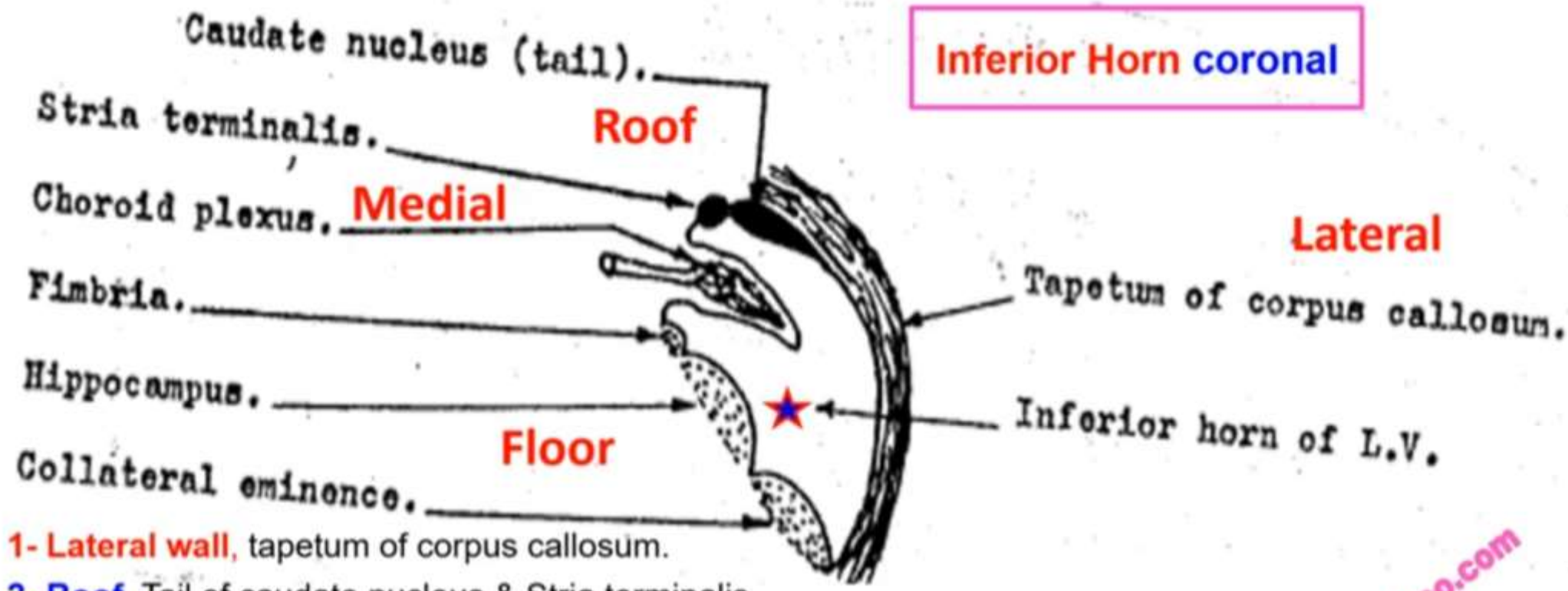
1- Roof, lateral wall and floor; tapetum of corpus callosum.

2- Medial wall; shows 2 elevations;

a- Bulb of posterior horn (upper); is formed by forceps major of corpus callosum.

b- Calcar avis (lower); produced by the calcarine sulcus.

Inferior Horn coronal



1- **Lateral wall**, tapetum of corpus callosum.

2- **Roof**, Tail of caudate nucleus & Stria terminalis.

3- **Medial wall**: choroid fissure invaginated by choroid plexus.

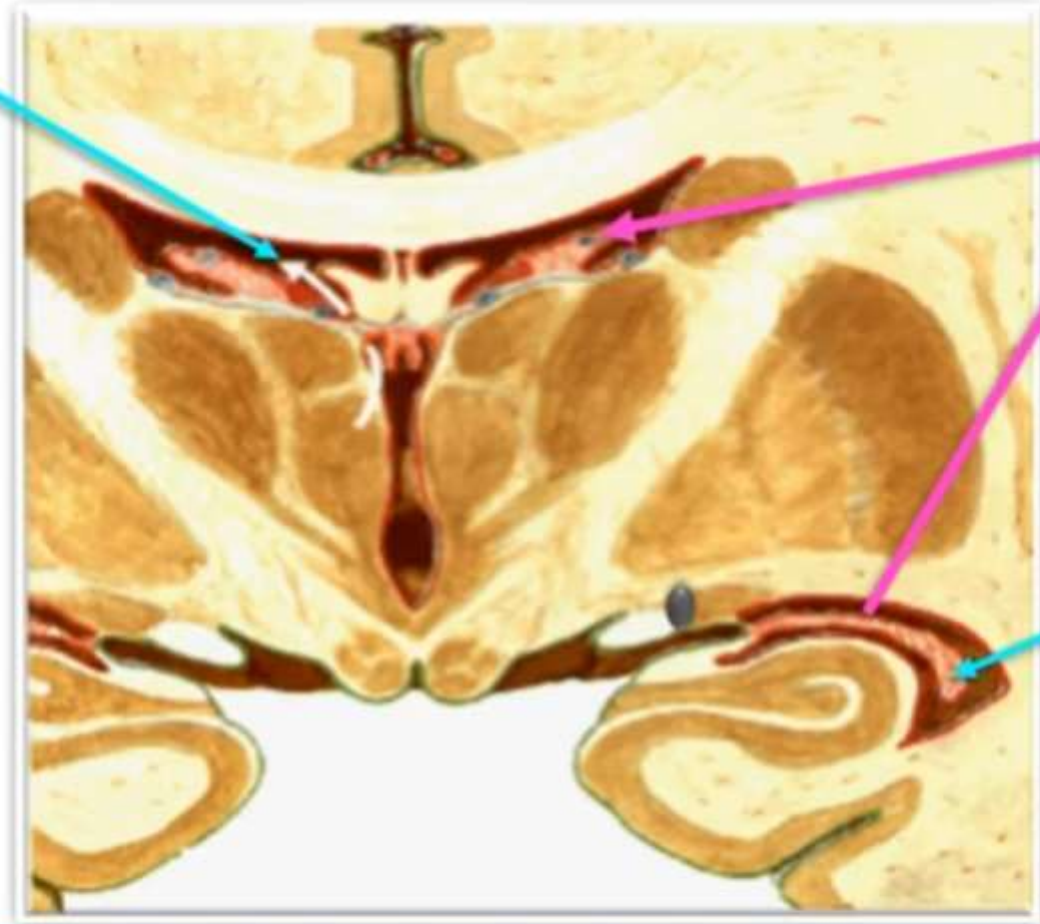
4- **Floor**; from lateral to medial;

a- Collateral eminence produced by the collateral sulcus.

b- Hippocampus

c- Fimbria of the hippocampus.

The central part of the lateral ventricle



Choroid Plexus of the Lateral Ventricle

The inferior horn of the lateral ventricle

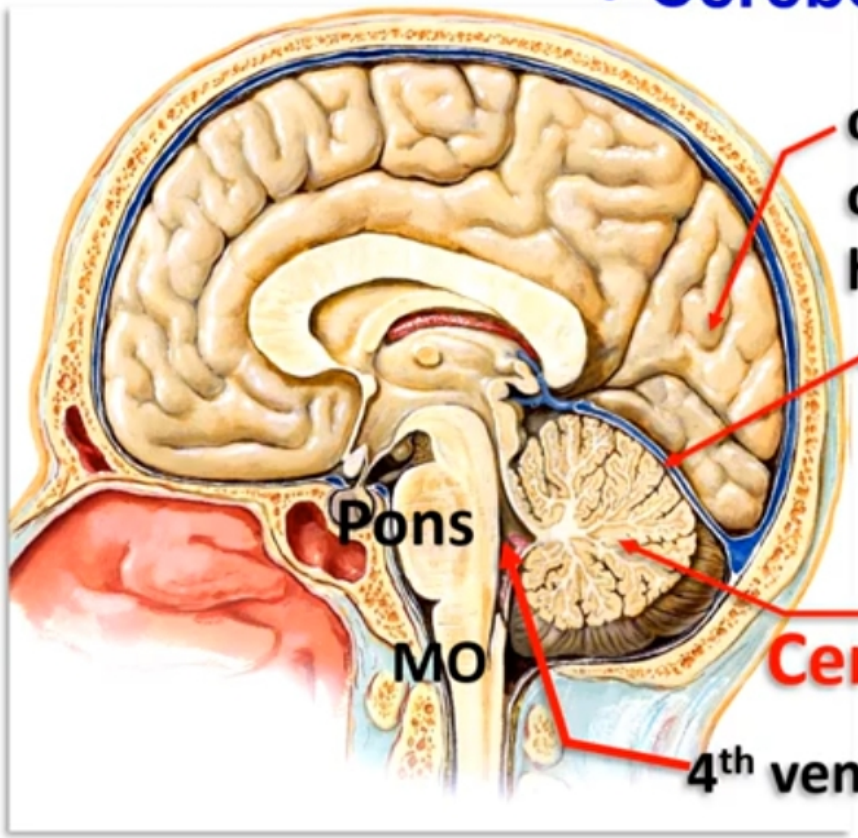
Choroid plexus of the lateral ventricle

- **Tela choroidae**; double-layer of pia matter contains choroid plexuses
- **Choroid plexus** in **central part** is formed by **posterior choroidal branches of posterior cerebral artery.**
- **Choroid plexus** in **inferior horn** is formed by **anterior choroidal branches of internal carotid artery**.

"سل الله أن يحبك حبًا تتجاوز به الحياة حتى تنتهي بك وهو راضٍ عنك، سله أن يُعظم الرضا في صدرك، واليقين في قلبك فتغدو الأمور الشديدة هيّنة عليك"
- الرافعي

- **The cerebellum** occupies posterior cranial fossa.
- It is the largest subdivision of the hindbrain.
- It lies posterior to the pons and medulla oblongata separated from them by the 4th ventricle.
- it is covered by the tentorium cerebelli separating it from the cerebral hemisphere.

• Cerebellum



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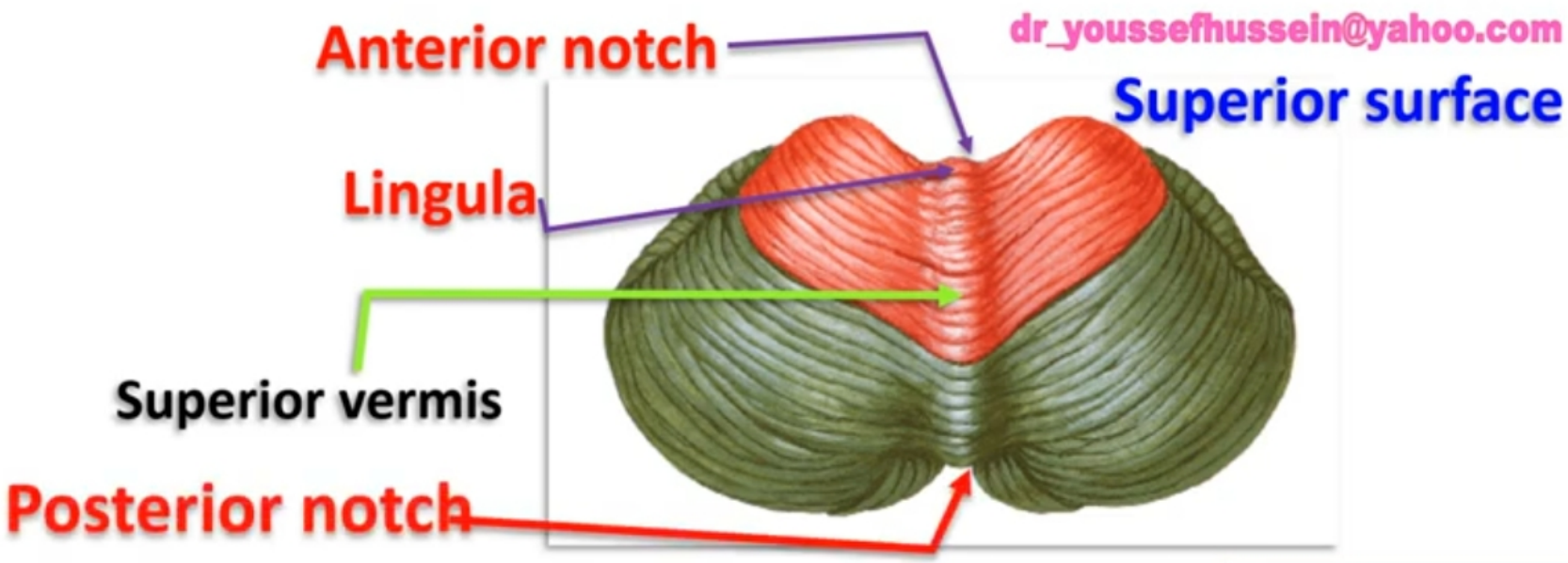

- **Superior surface,**

- The middle part is raised and called **superior vermis**.
- The **lingua** is the most anterior part of the superior vermis. .

It has

2 hemispheres
2 surfaces
2 vermis
2 notches
3 lobes

- **Inferior surface,**

- The middle part is called **inferior vermis** and lies in the bottom of a depression between the two hemispheres called **Vallecula**.

- The inferior vermis consists of **nodule, uvula and pyramid**.

- **Tonsil** is a small part of the cerebellar hemisphere that lies lateral to the inferior vermis.

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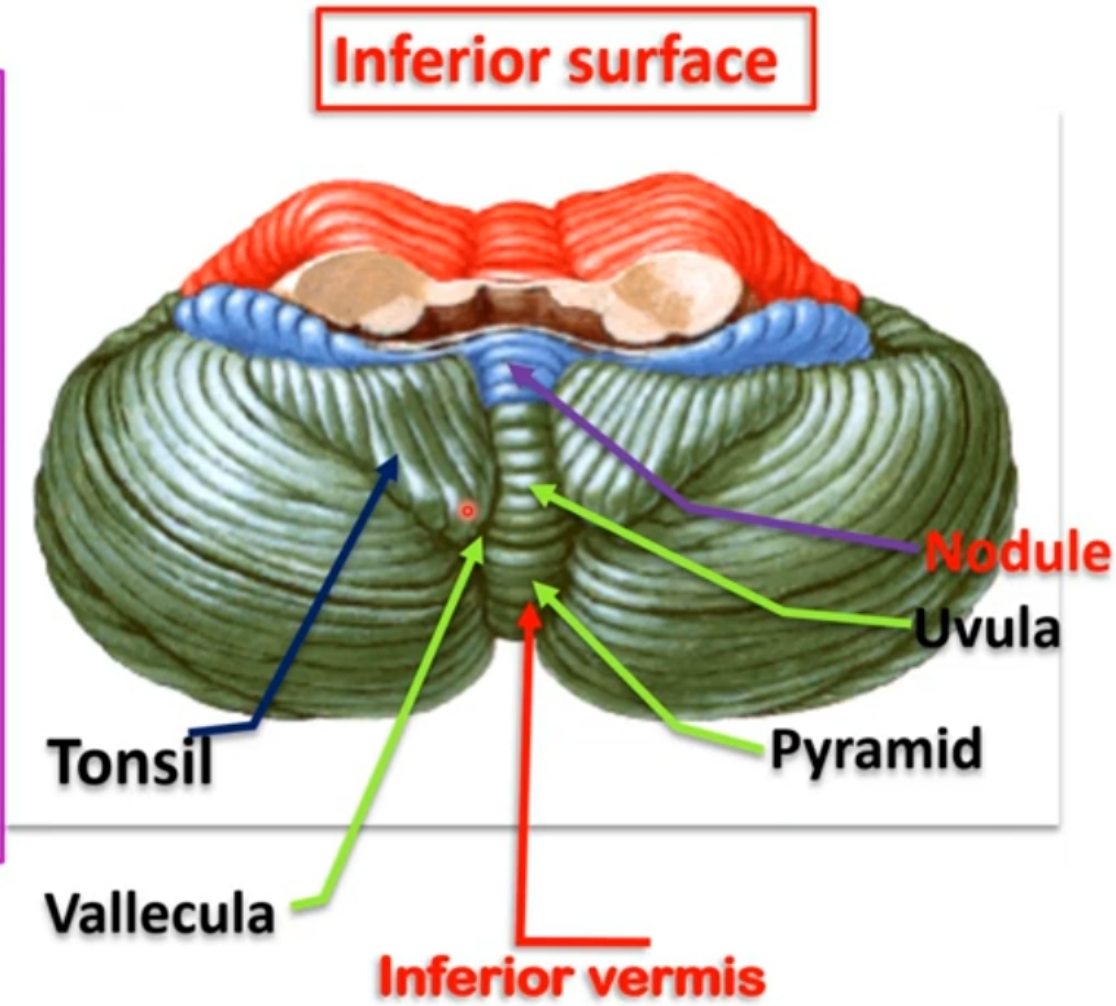

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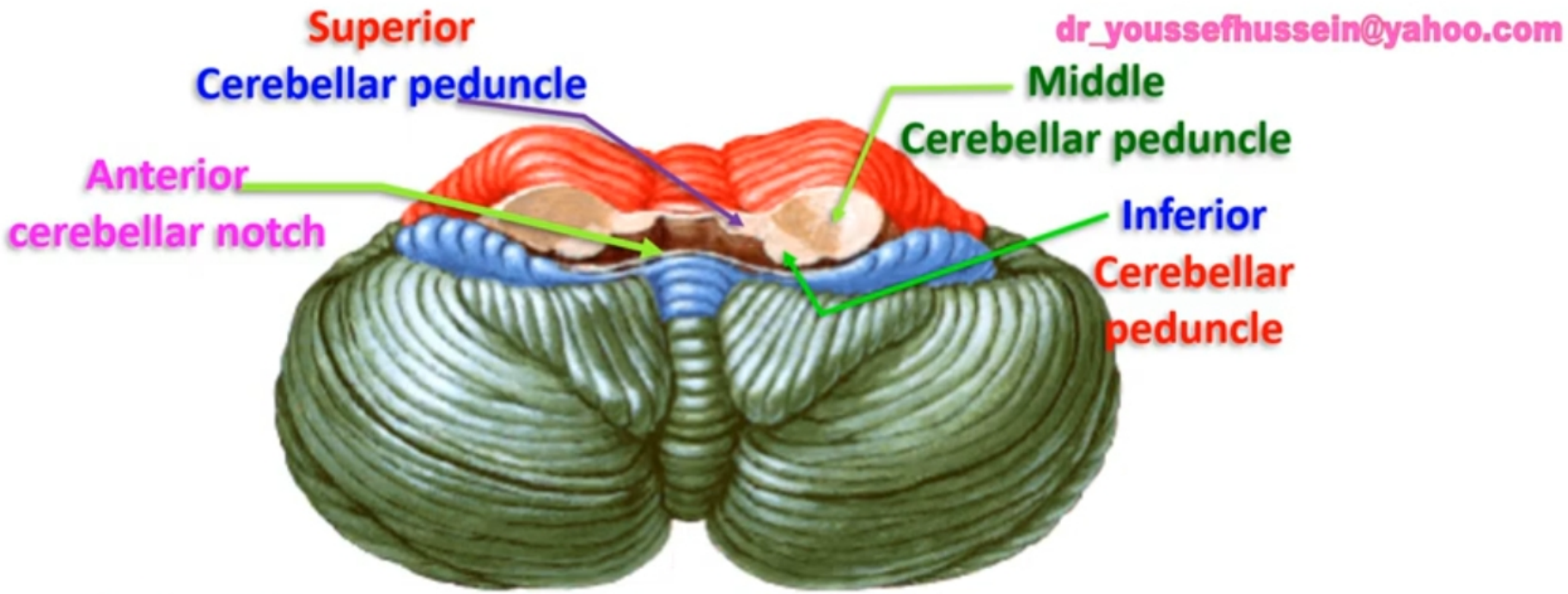
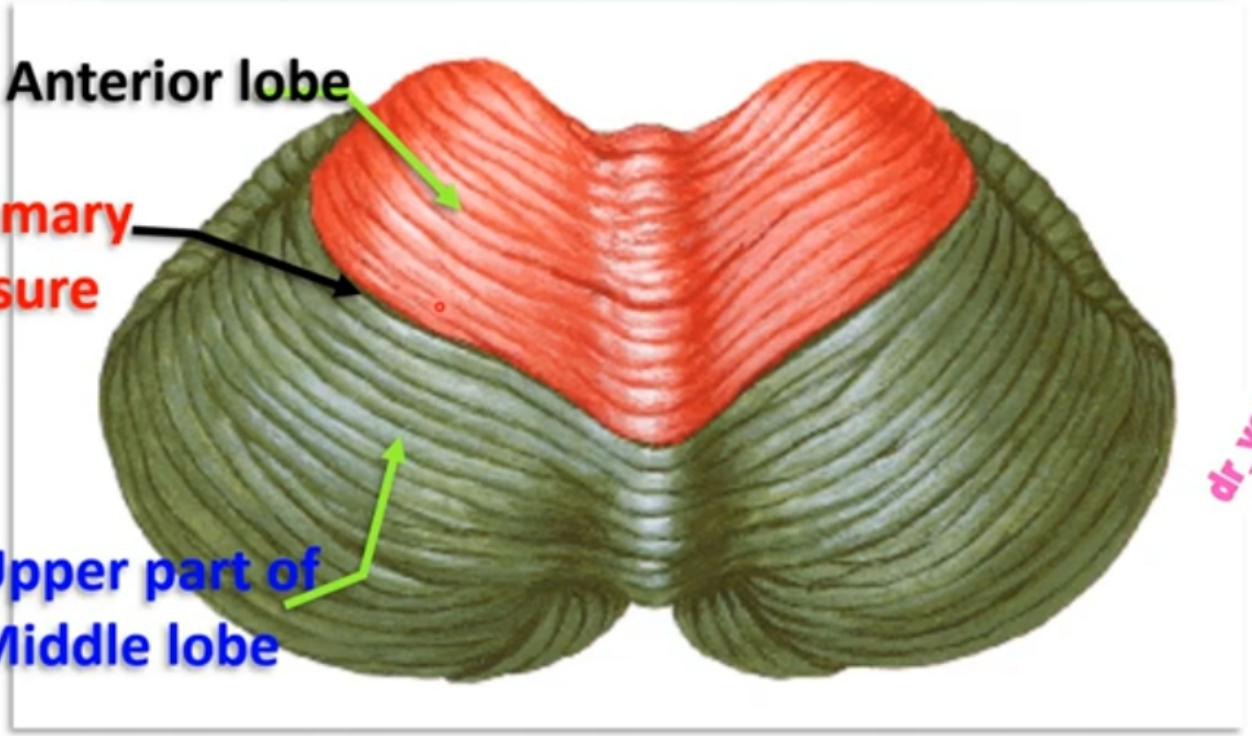


- **Anterior notch:** separated from the back of the pons and open medulla by the 4th ventricle.

- It contains 3 cerebellar peduncles that connecting the cerebellum with the brain stem (**MIS)** middle, inferior and superior from lateral to medial.

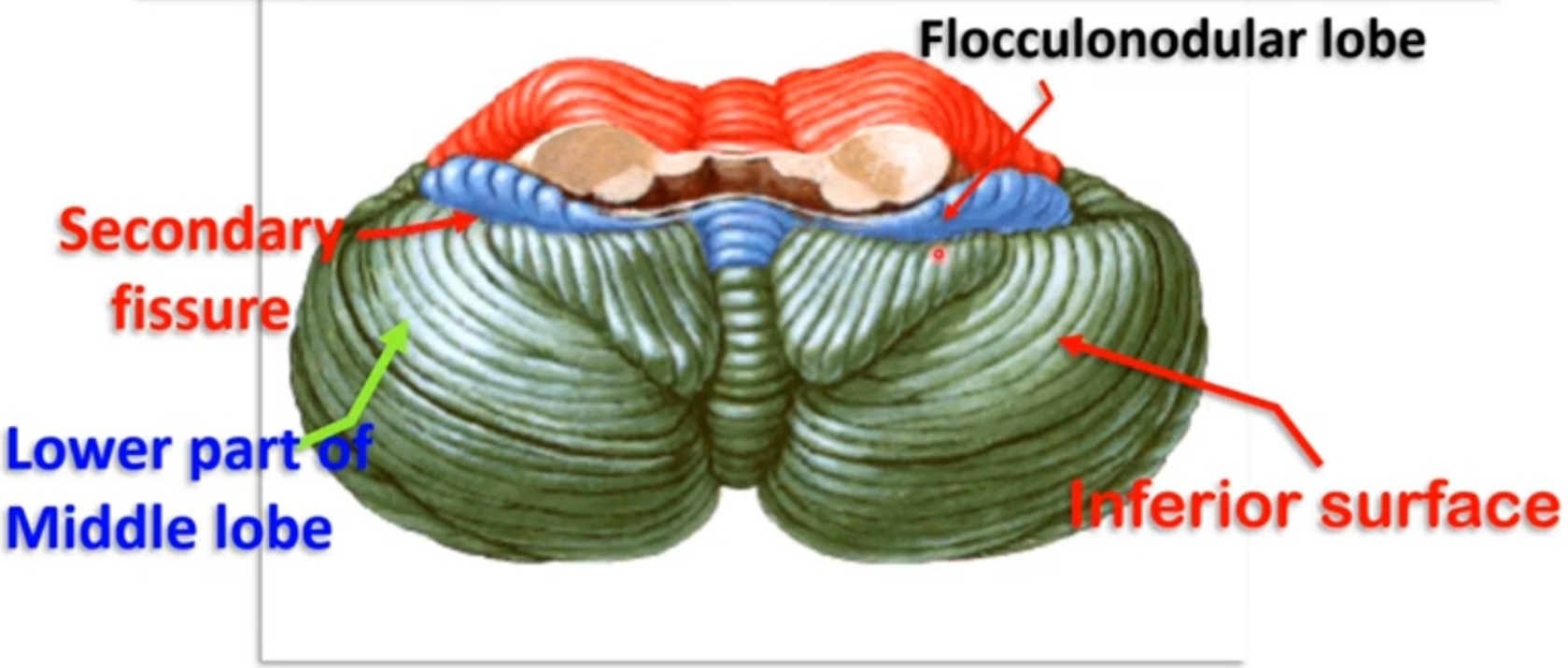
- **Posterior notch** containing falx cerebelli.

Primary fissure on Superior surface

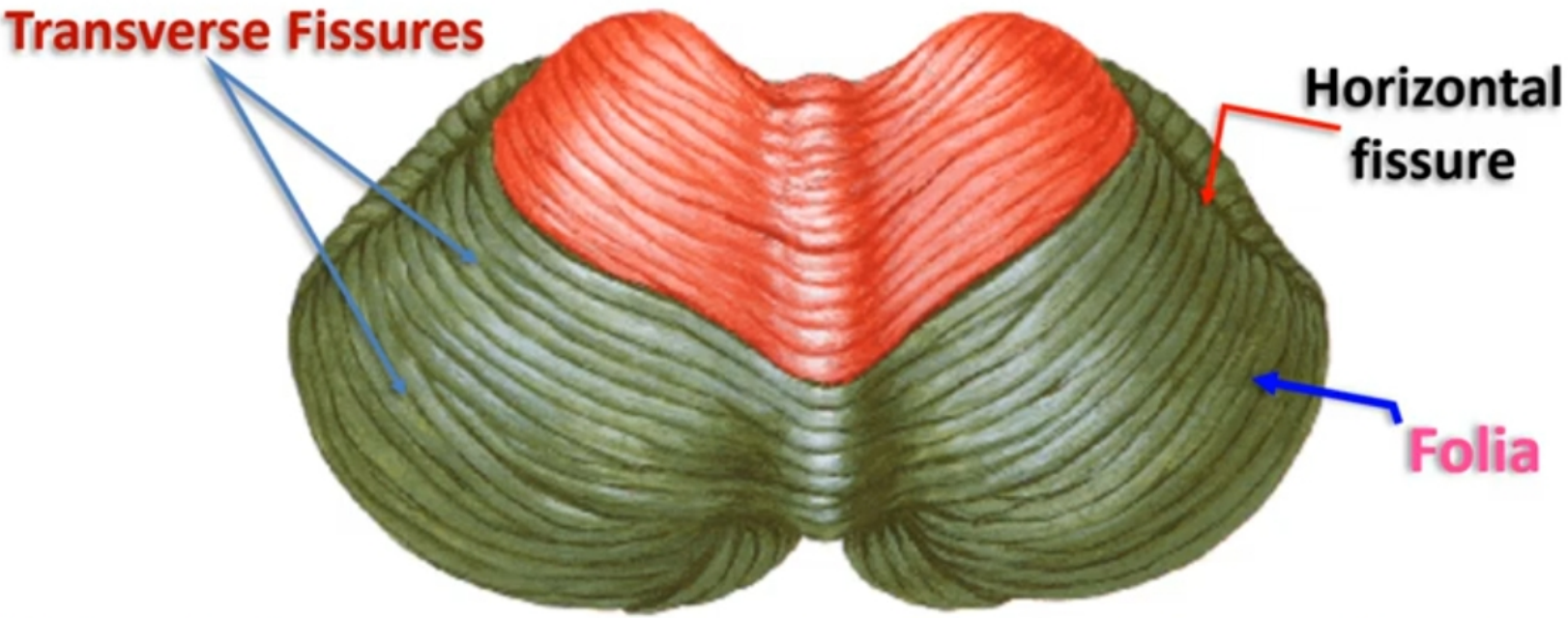


It is a wide V-shaped fissure which separates the anterior lobe from the middle lobe behind it

Secondary fissure, posterolateral



On the inferior surface, It separates the middle lobe from the Flocculonodular lobe.



- Horizontal fissure extends from anterior to posterior notches along the margin of the cerebellum and separates the superior from the inferior surfaces.
- Great number of transverse fissures on the superior and inferior surfaces. The part of the cerebellum between the transverse fissures called folia.

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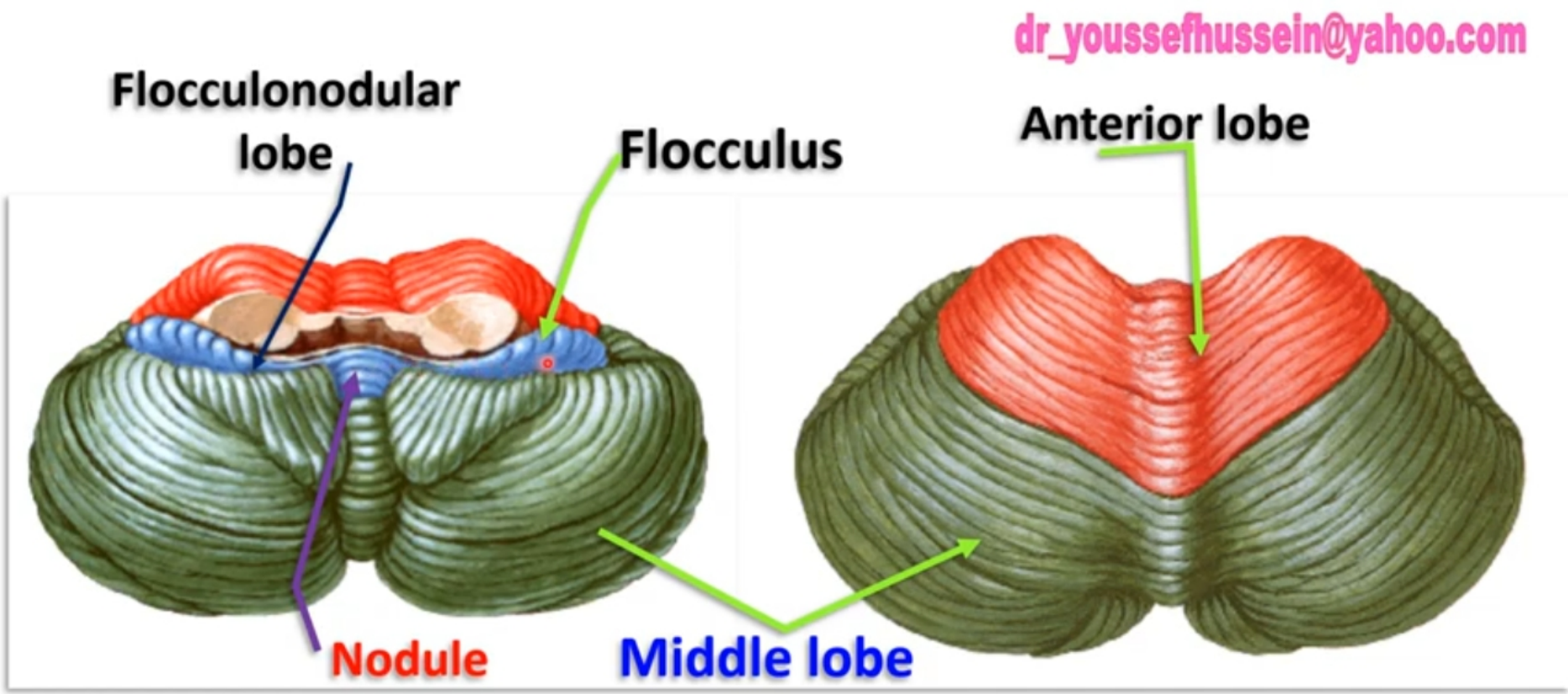
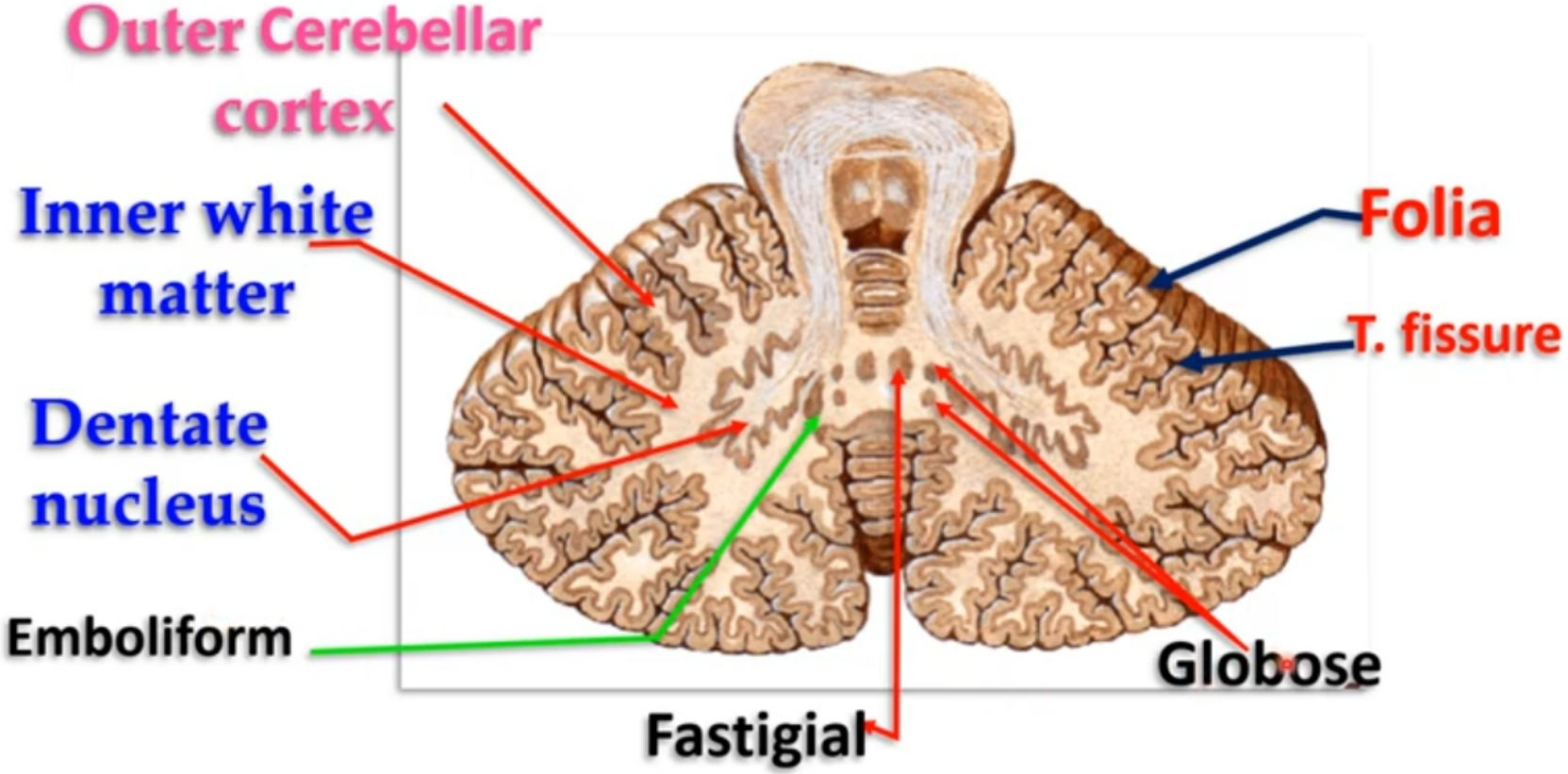


Inferior surface

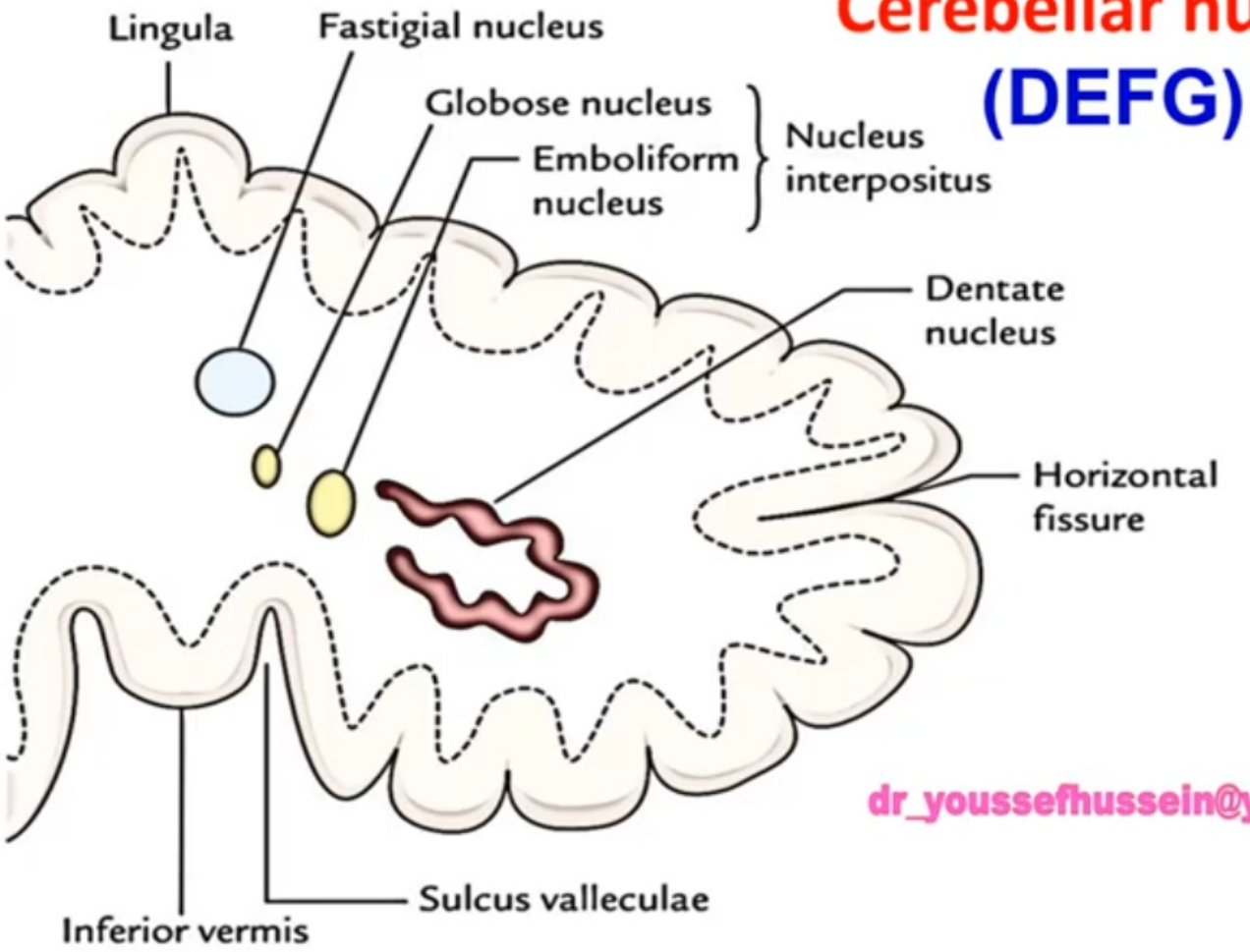
Lobes

Superior surface

The cerebellum has an outer cortex, an inner white matter, in which deep nuclei are embedded



Cerebellar nuclei (DEFG)



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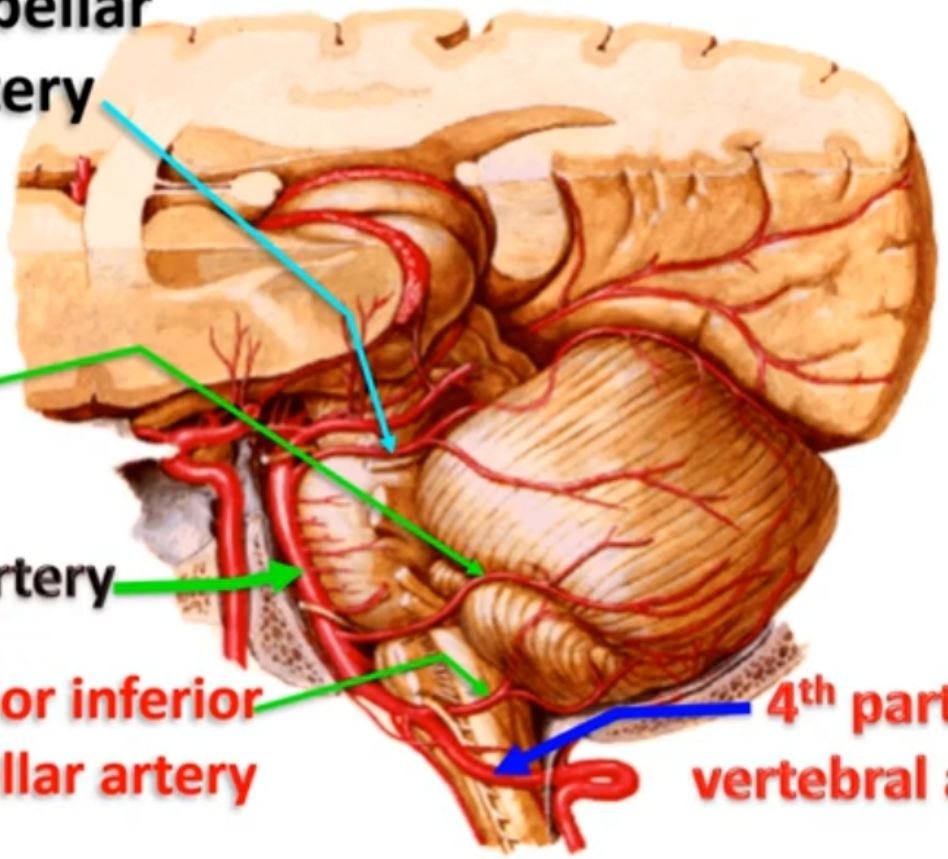
Blood supply of cerebellum



① superior cerebellar artery

② Anterior inferior cerebellar artery

Basilar artery

③ Posterior inferior cerebellar artery

4th part of vertebral artery

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