



Blood Supply of Brain

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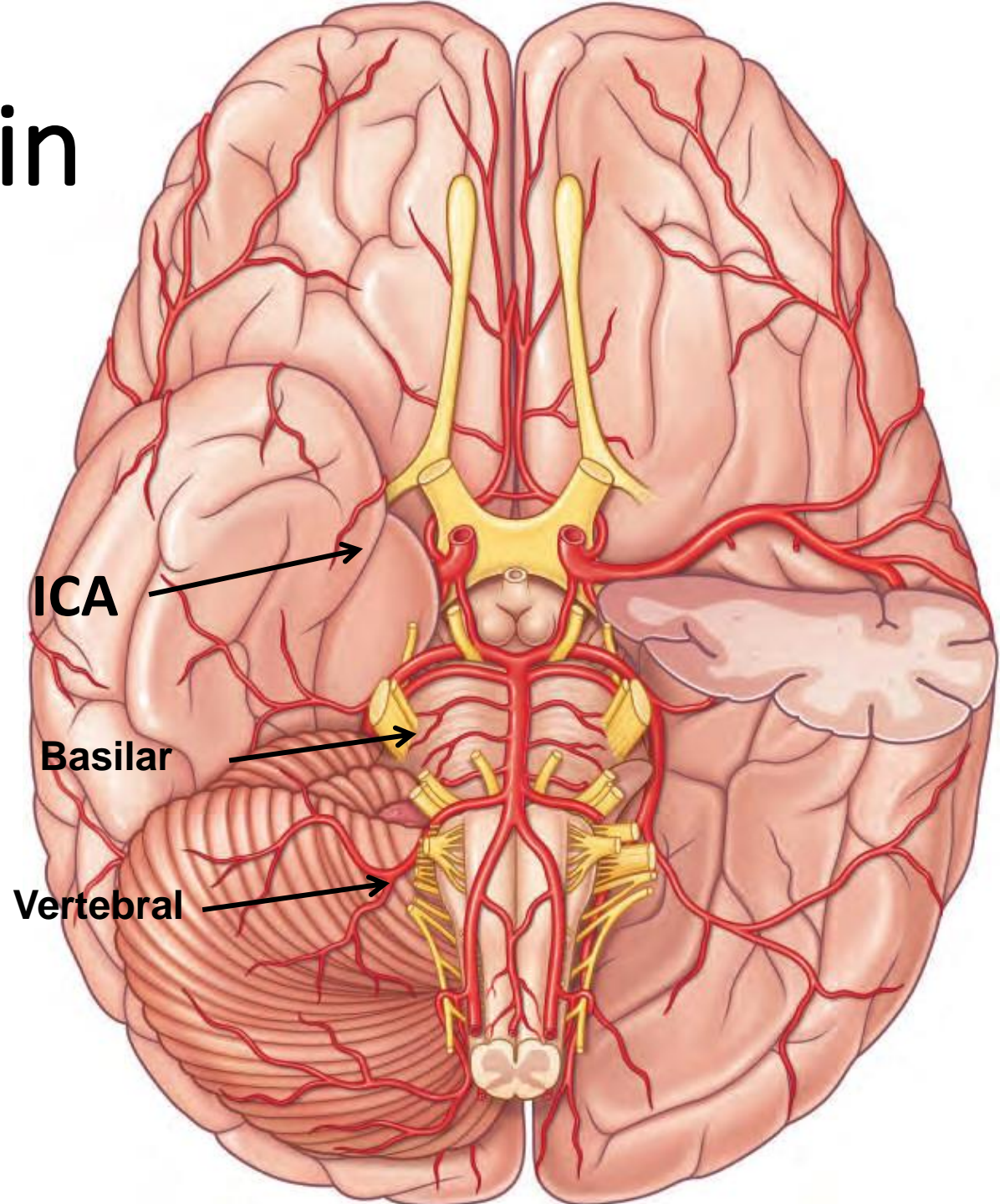
Arterial

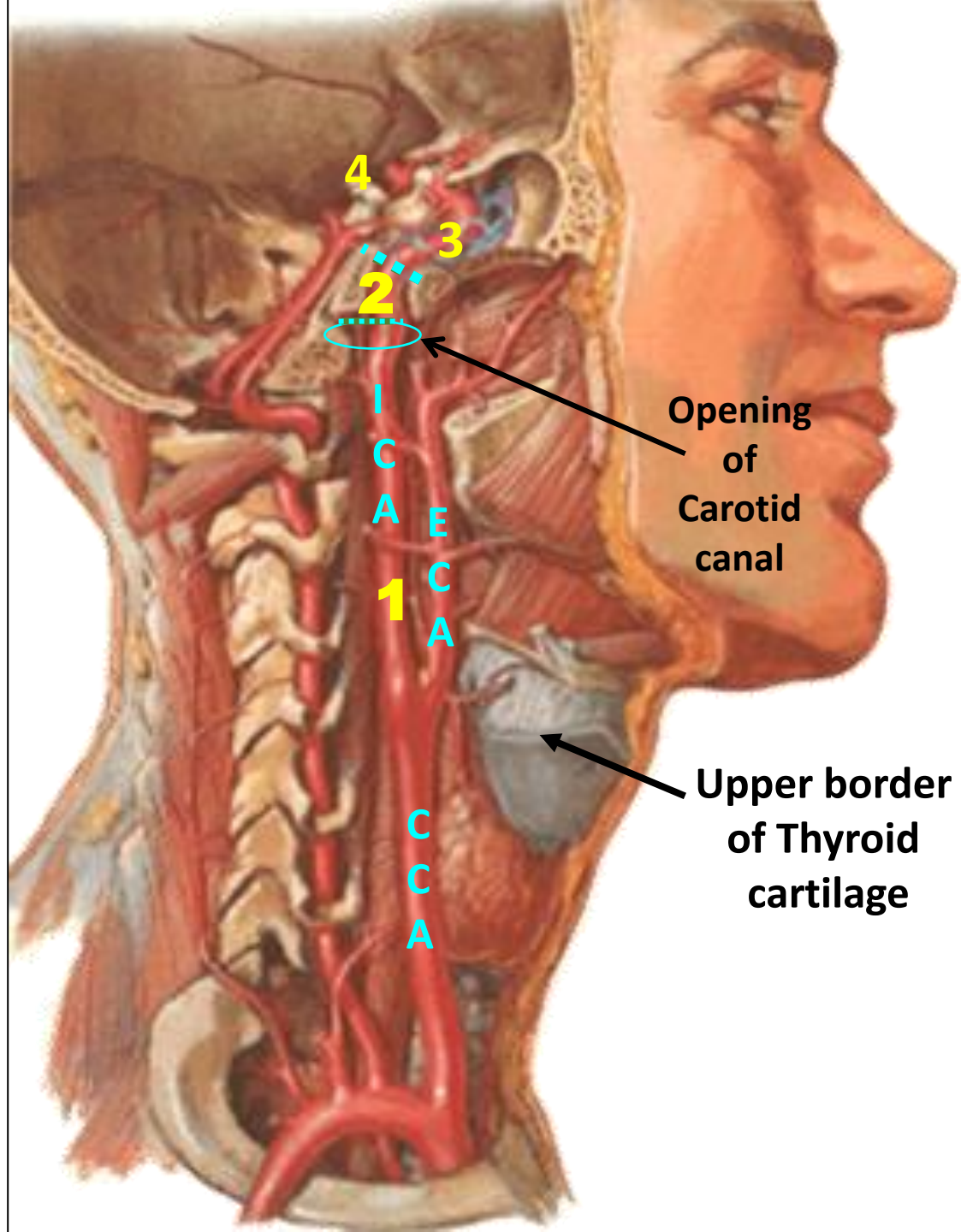
Two arterial systems

1- **Carotid system**

2- **Vertebro-basilar system**

- Both anastomose at the **CIRCLE OF WILLIS.**



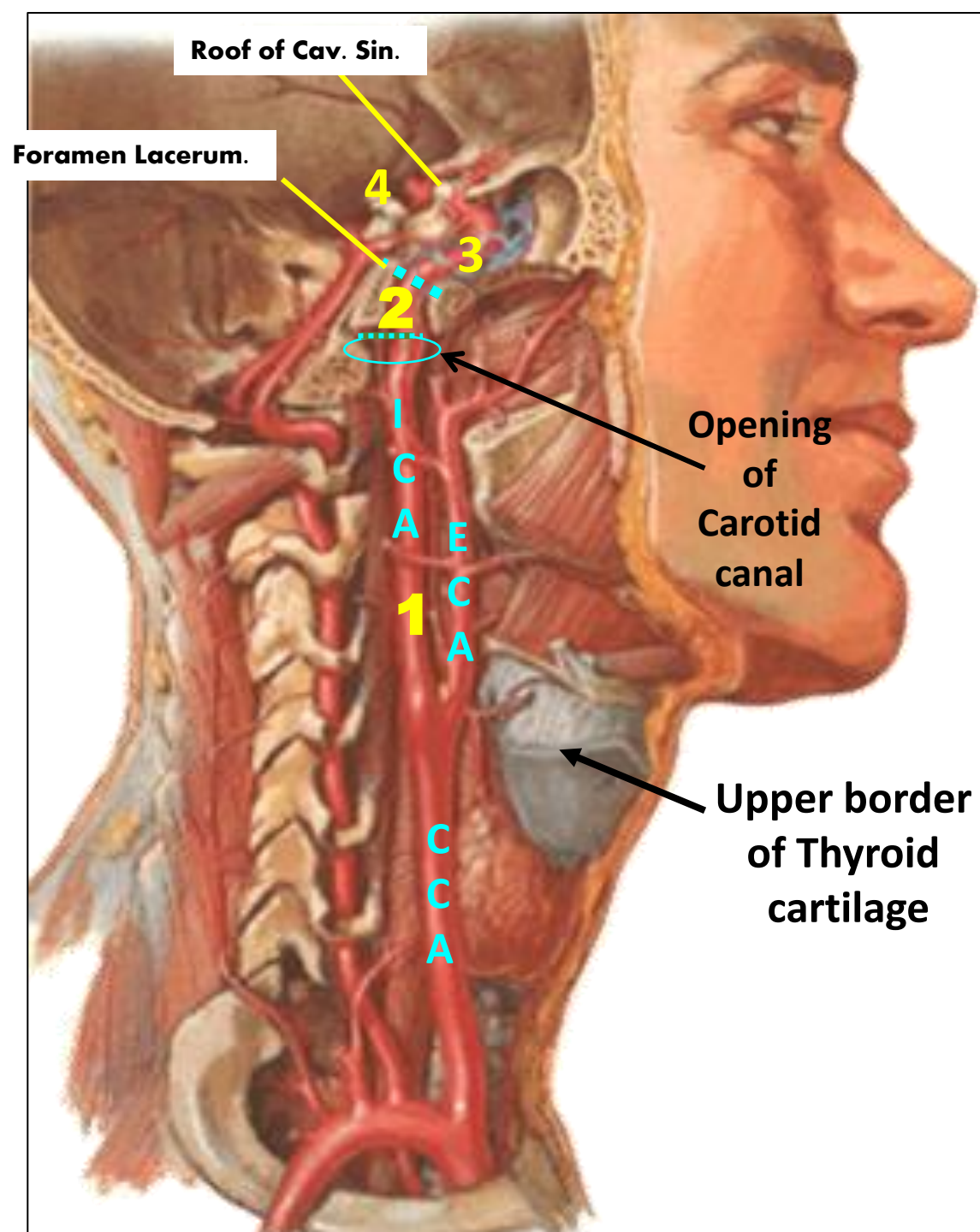


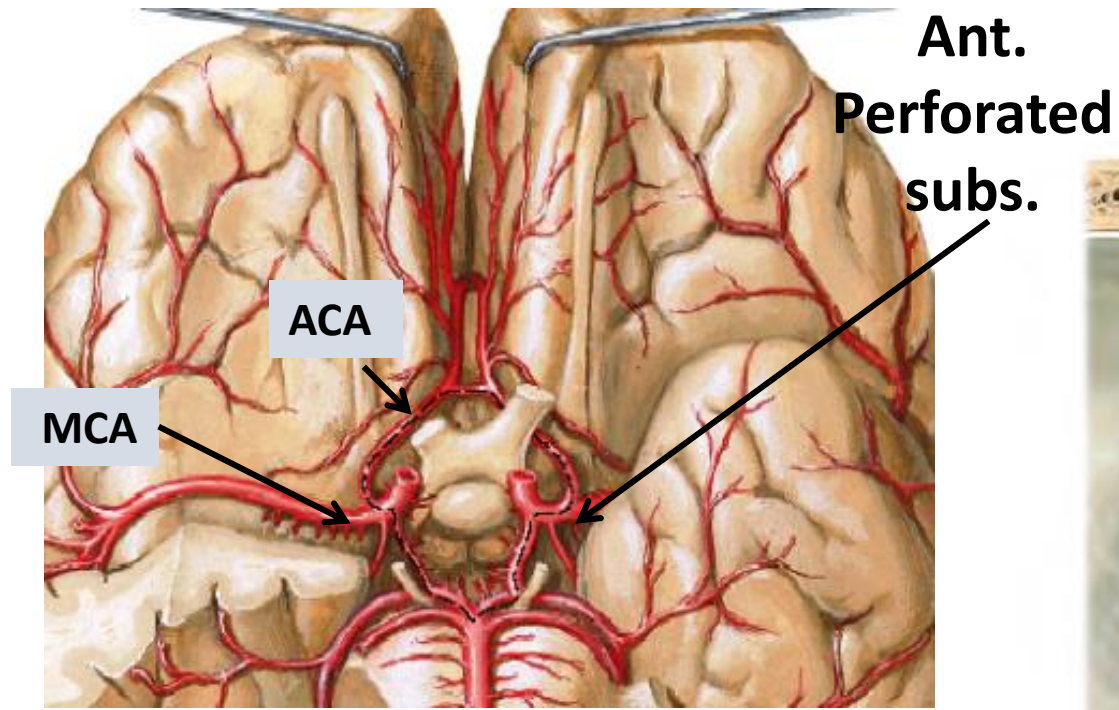
Internal Carotid A (ICA)

- **Begins** at bifurcation of **CCA in the neck (at upper border of thyroid cartilage)** [disc between C3 and C4].
- **Course:** it is divided into 4 parts

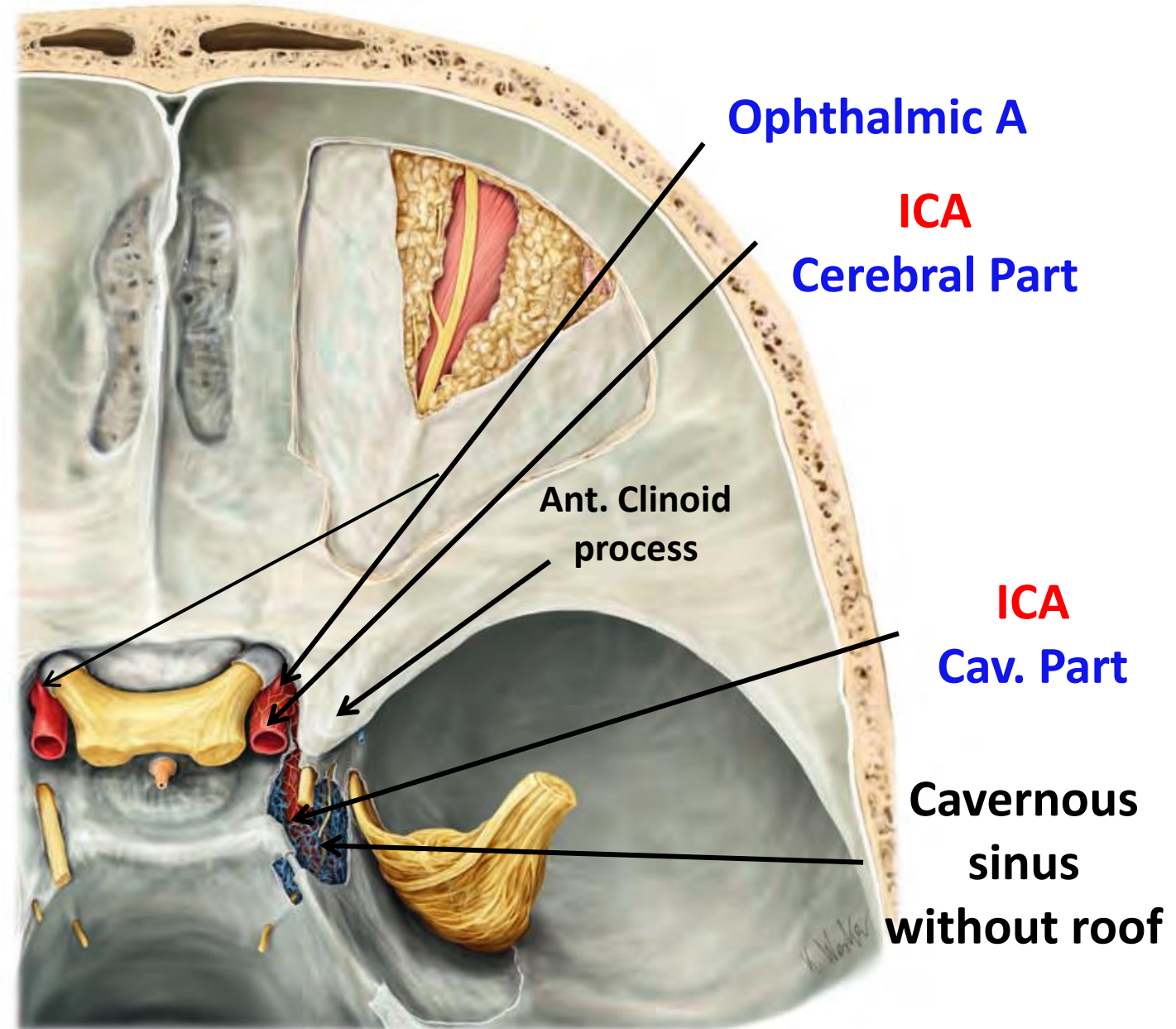
Internal Carotid A. (ICA)

- 1st part = **Cervical Part**
- 2nd part = **Petrous Part** passes through **carotid canal** of skull to enter cranial cavity via **foramen lacerum**.
- 3rd part = **Cavernous Part** runs in cavernous sinus
- 4th part = **Cerebral Part** emerges through **roof of cavernous sinus**

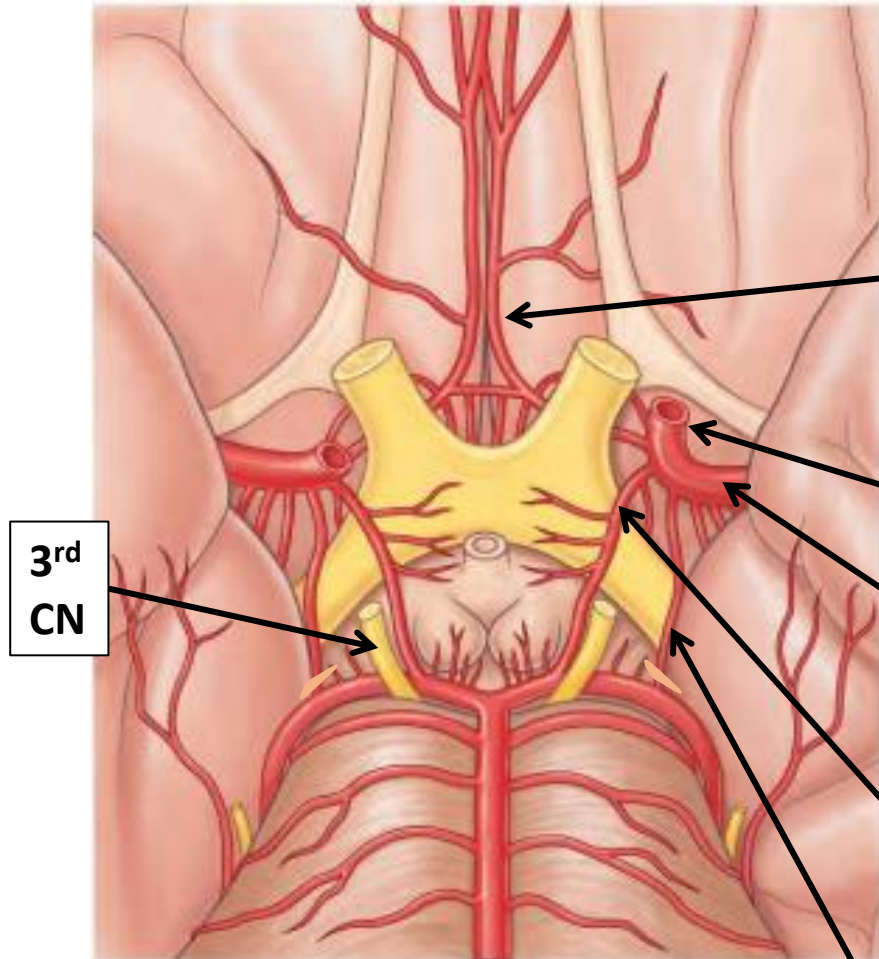




- **End:** opposite **anterior perforated substance** by dividing into anterior and middle cerebral arteries (ACA & MCA).



Branches of cerebral part of ICA



1. Ophthalmic A.

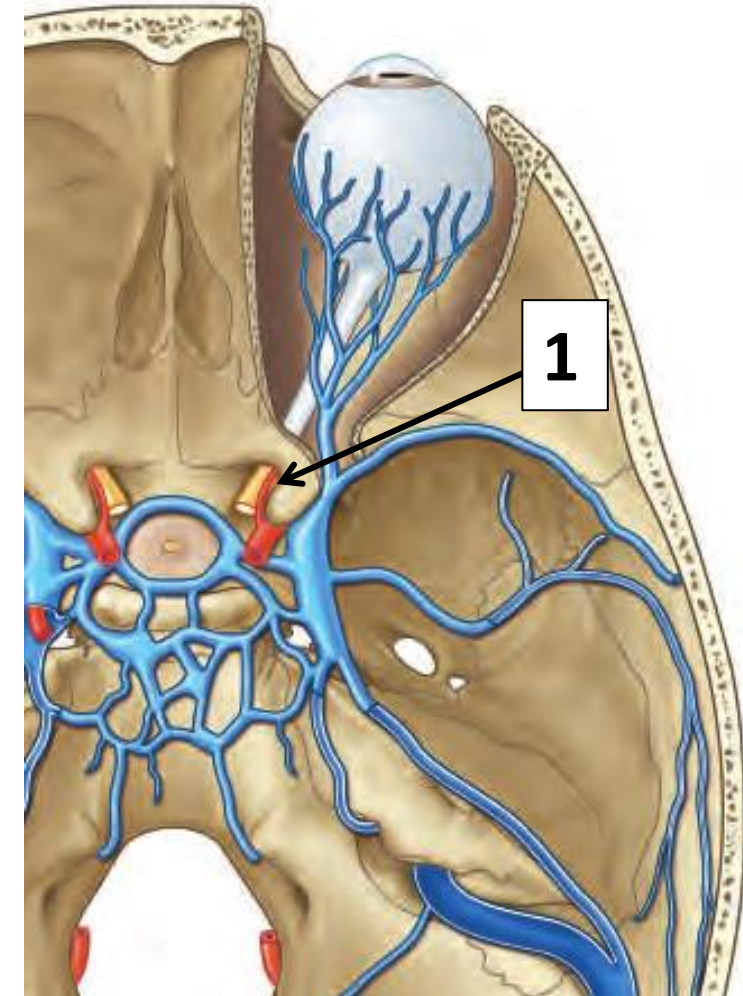
2. Anterior cerebral A.
(ACA)

Internal carotid A.

3. Middle cerebral A.
(MCA)

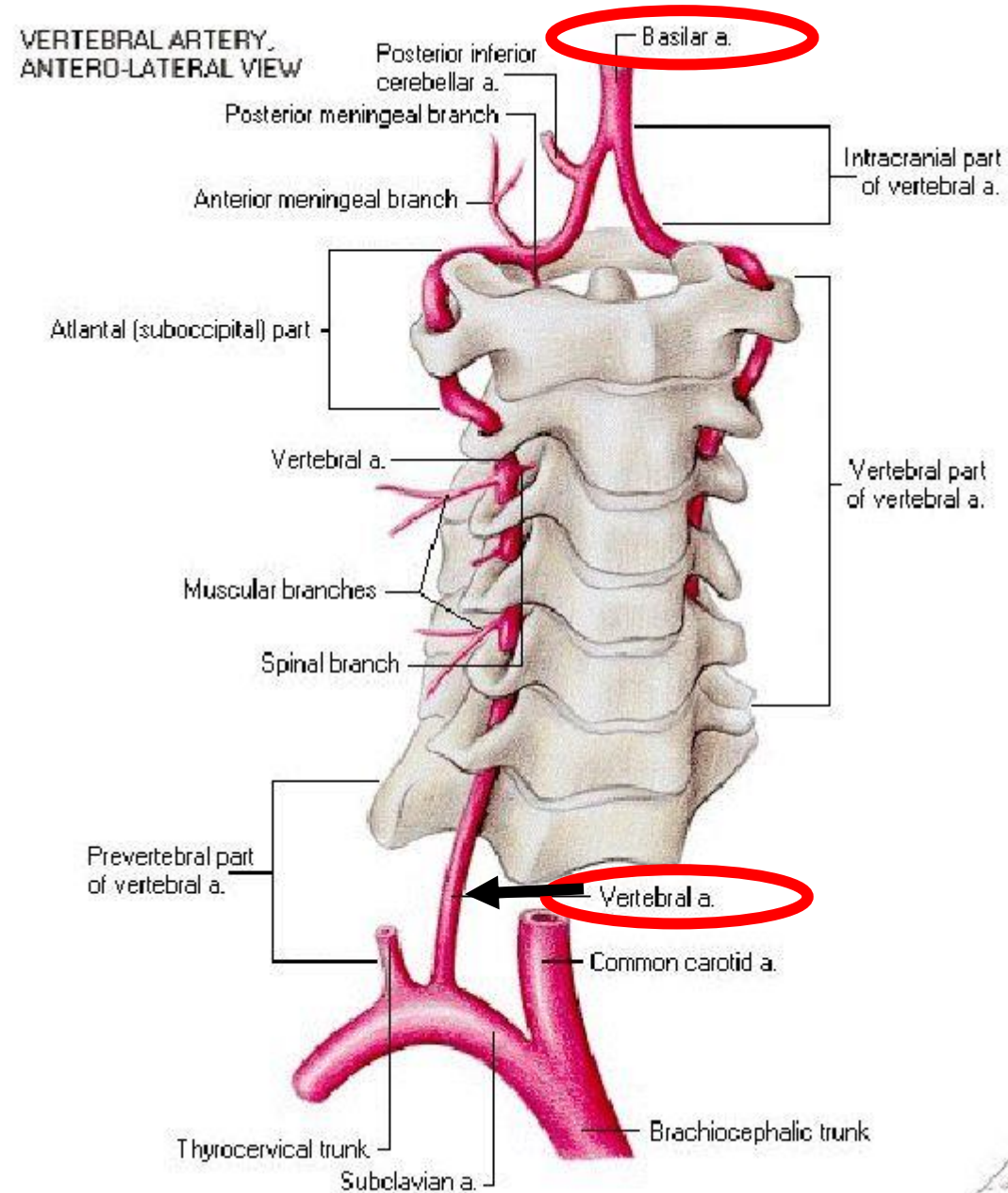
4. Posterior
communicating A.

5. Anterior choroidal A.



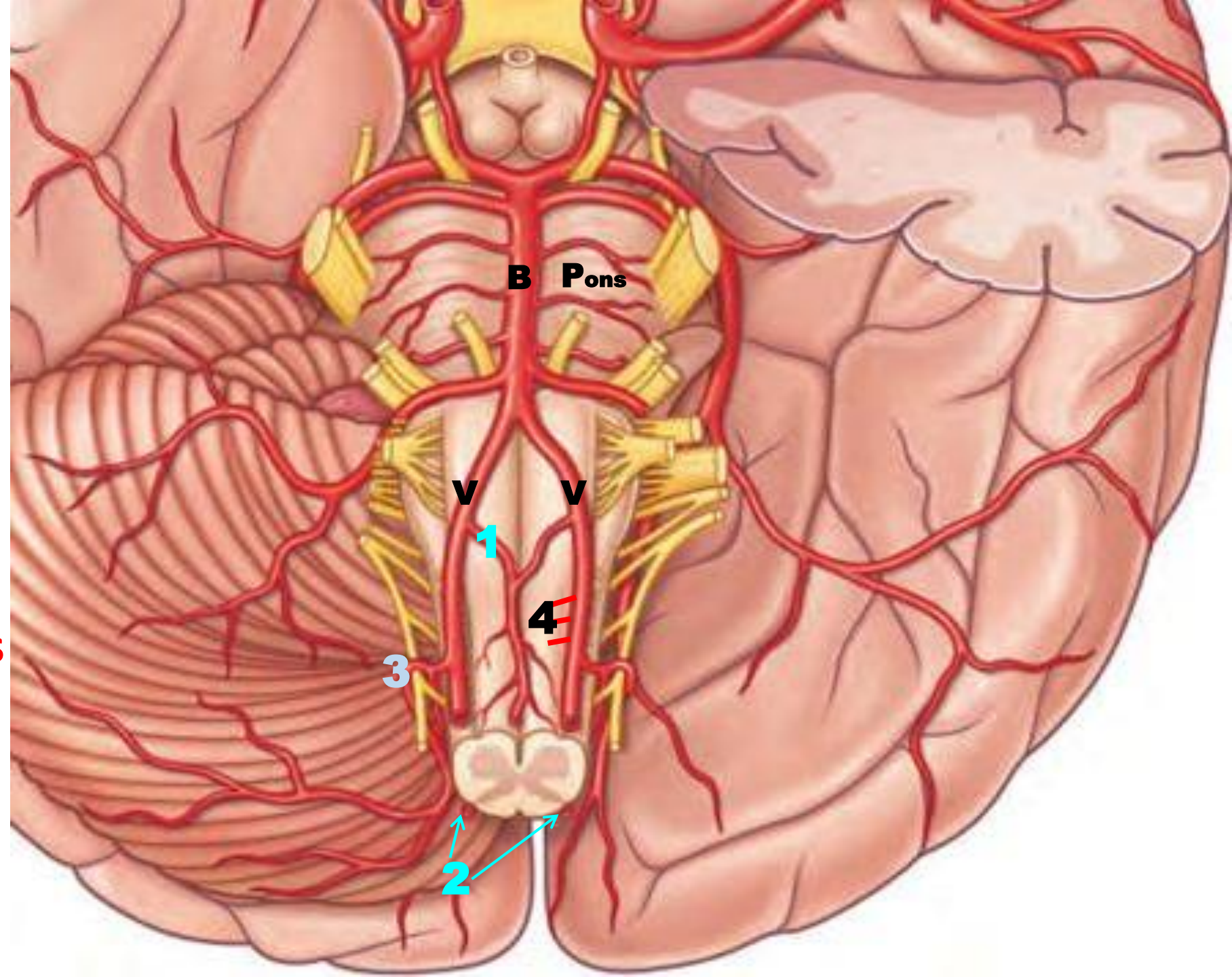
Vertebral artery

- Beginning branch of **first part of Subclavian Artery.**
- Ends at lower border of pons by joining the other vertebral to form **basilar artery.**



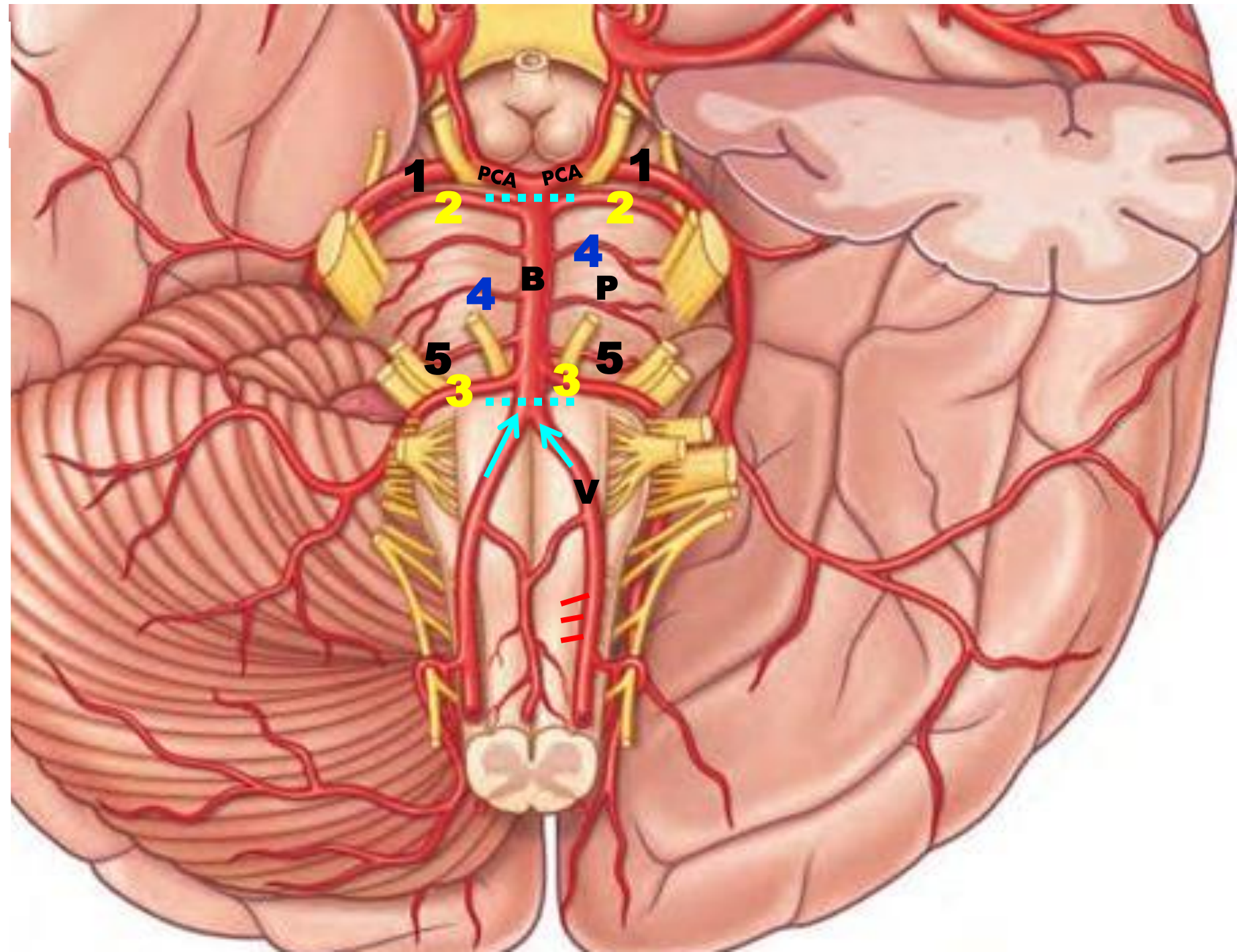
Branches of 4th part of vertebral artery

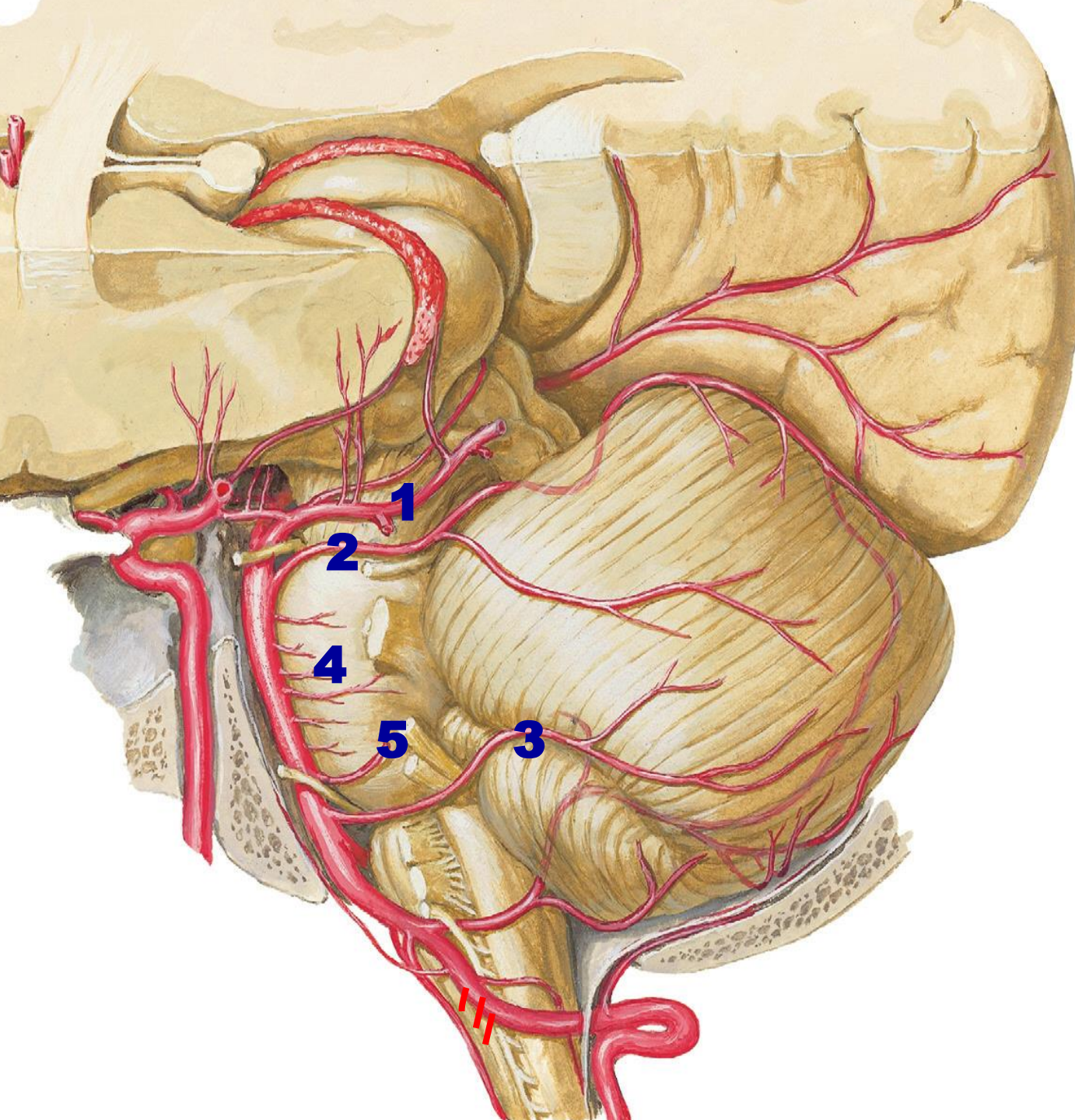
1. **Anterior spinal** (Rt.+ Lt. ... single spinal artery).
2. **Posterior spinal aa.**
3. **PICA.**
4. **Medullary branches**
5. **Meningeal.**



Basilar artery

- **Begins** by union of Rt & Lt. vertebral arteries at lower border of pons.
- **Ends** by giving its two terminal brs. Rt & Lt PCA". at the upper border of pons.





Branches of Basilar Artery

Terminal branches

1. Pos. cerebral A.

Two cerebellar

2. Superior cerebellar A.

3. Anterior inferior cerebellar
(AICA)

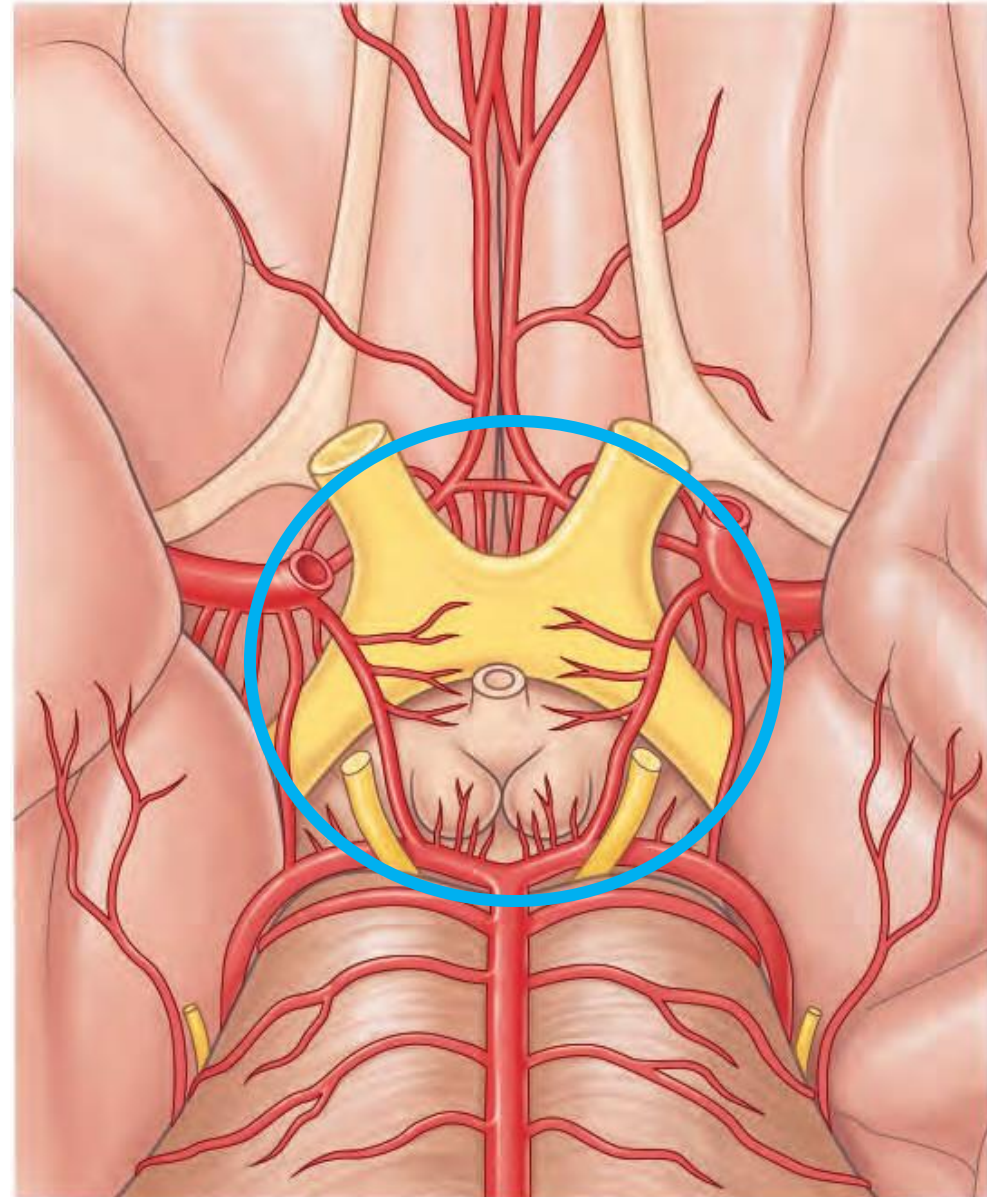
4. Pontine branches

5. Labyrinthine A.

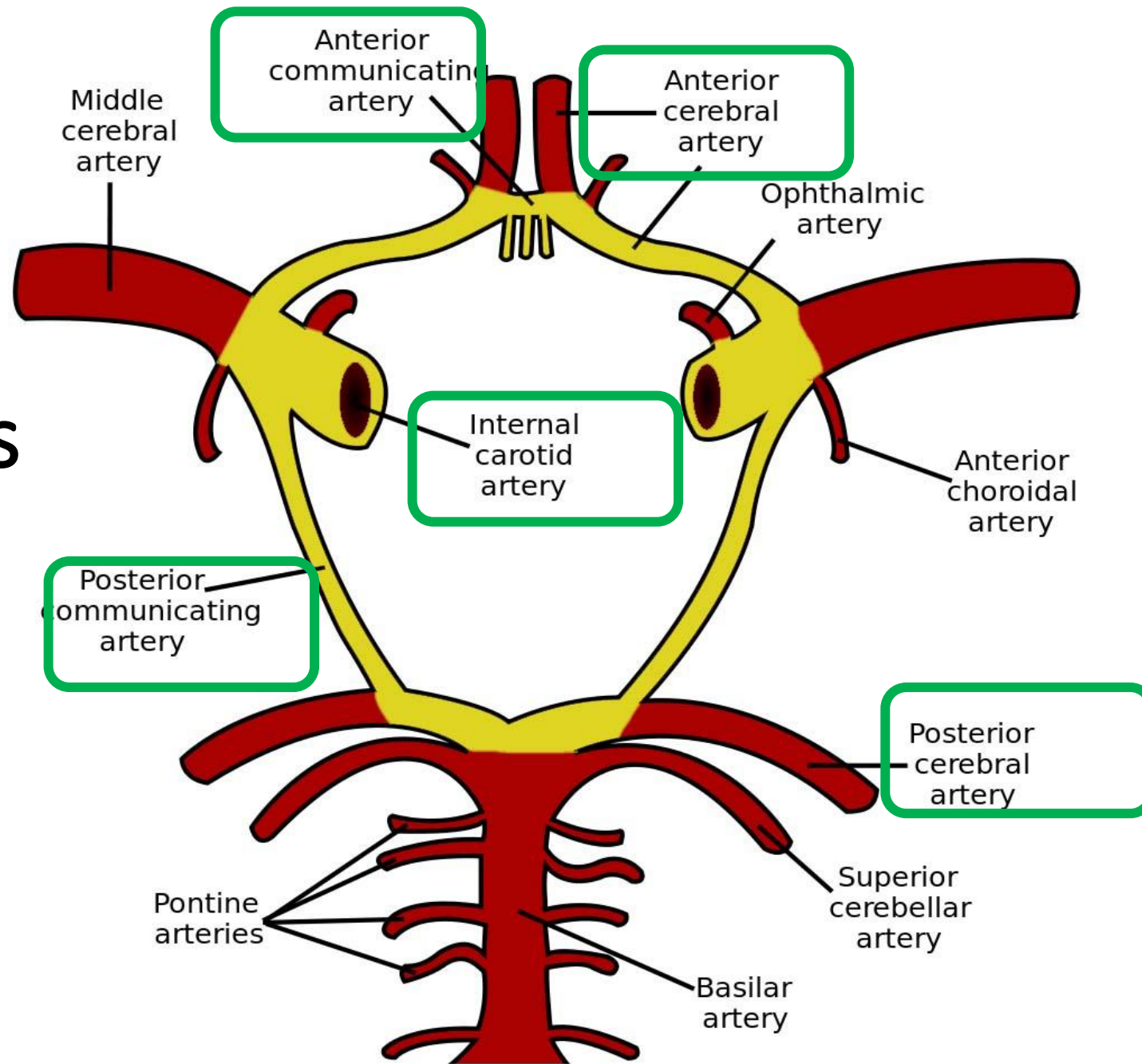
Circle of Willis

“Circulus arteriosus”

- **Definition:**
A large arterial anastomotic circle between the carotid and vertebrobasilar systems.
- **Site:**
at the base of the brain.
In the interpeduncular cistern.



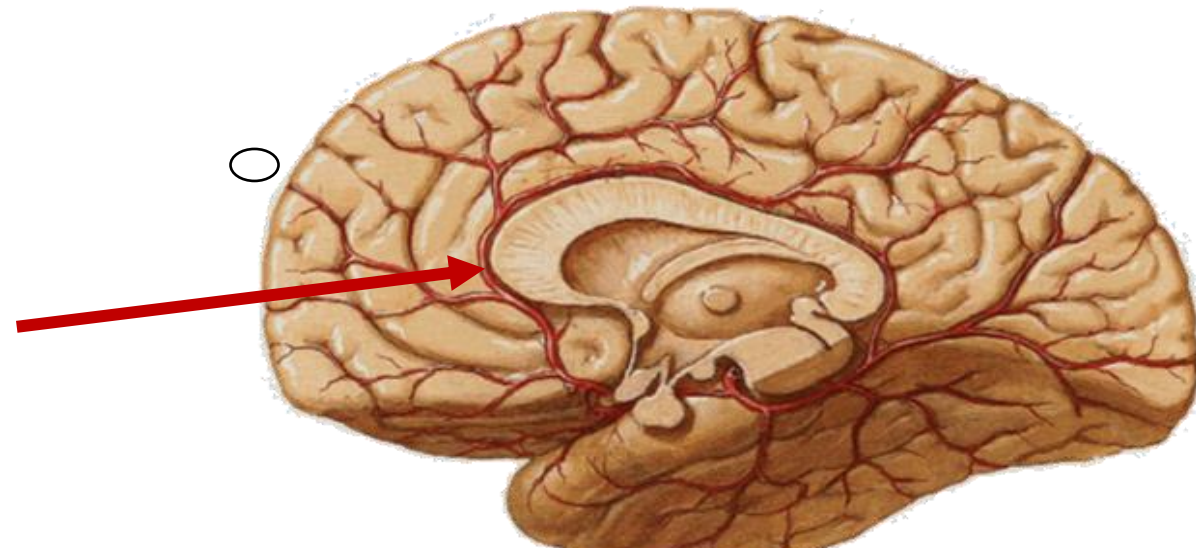
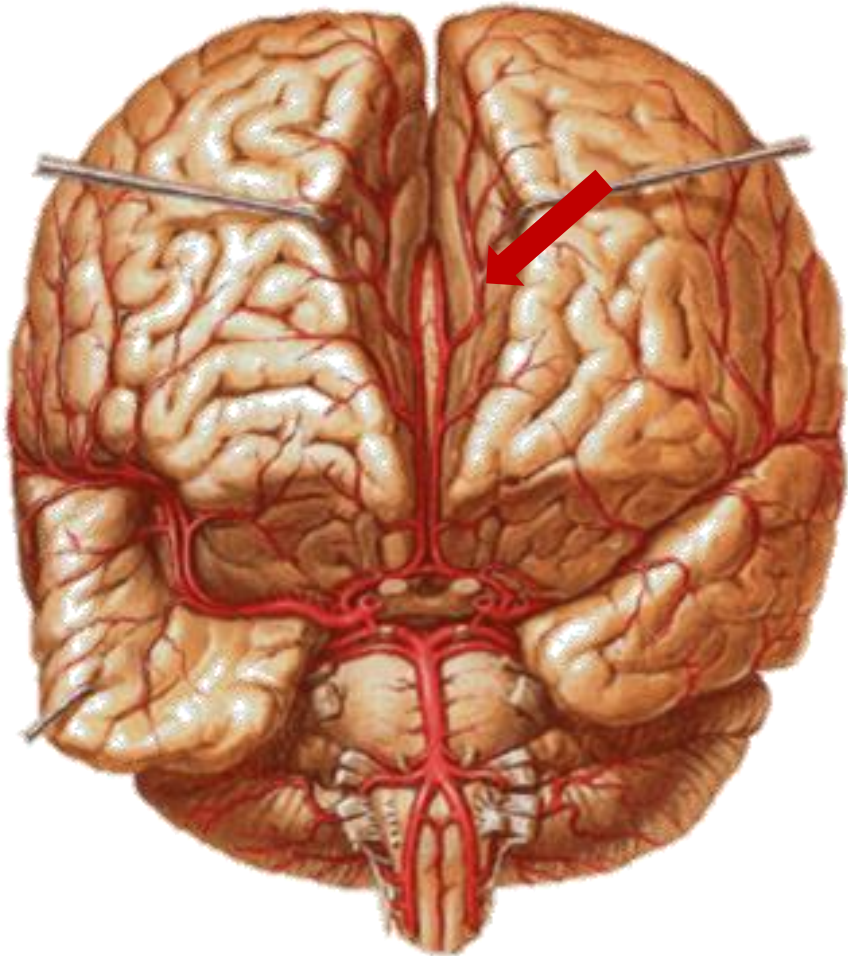
Circle of Willis



Anterior cerebral artery

ACA

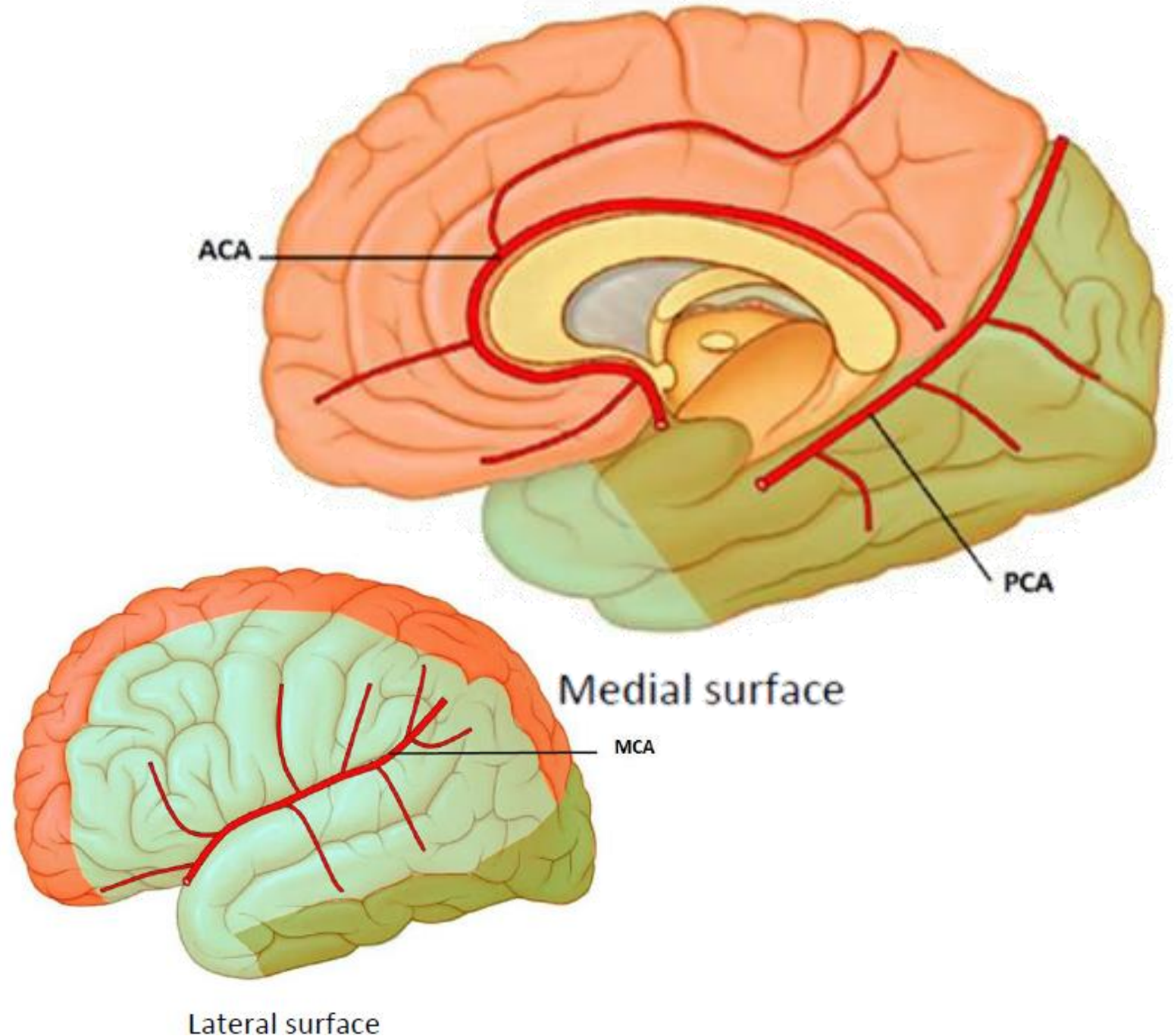
It runs towards the longitudinal fissure where it communicates with the other anterior cerebral artery through the anterior communicating artery. It runs backwards over corpus callosum. It ends near the Parieto-occipital Sulcus (P.O.S.) by anastomosing with the posterior cerebral artery. It has **Cortical** and **Central** branches.



Distribution of anterior cerebral A.

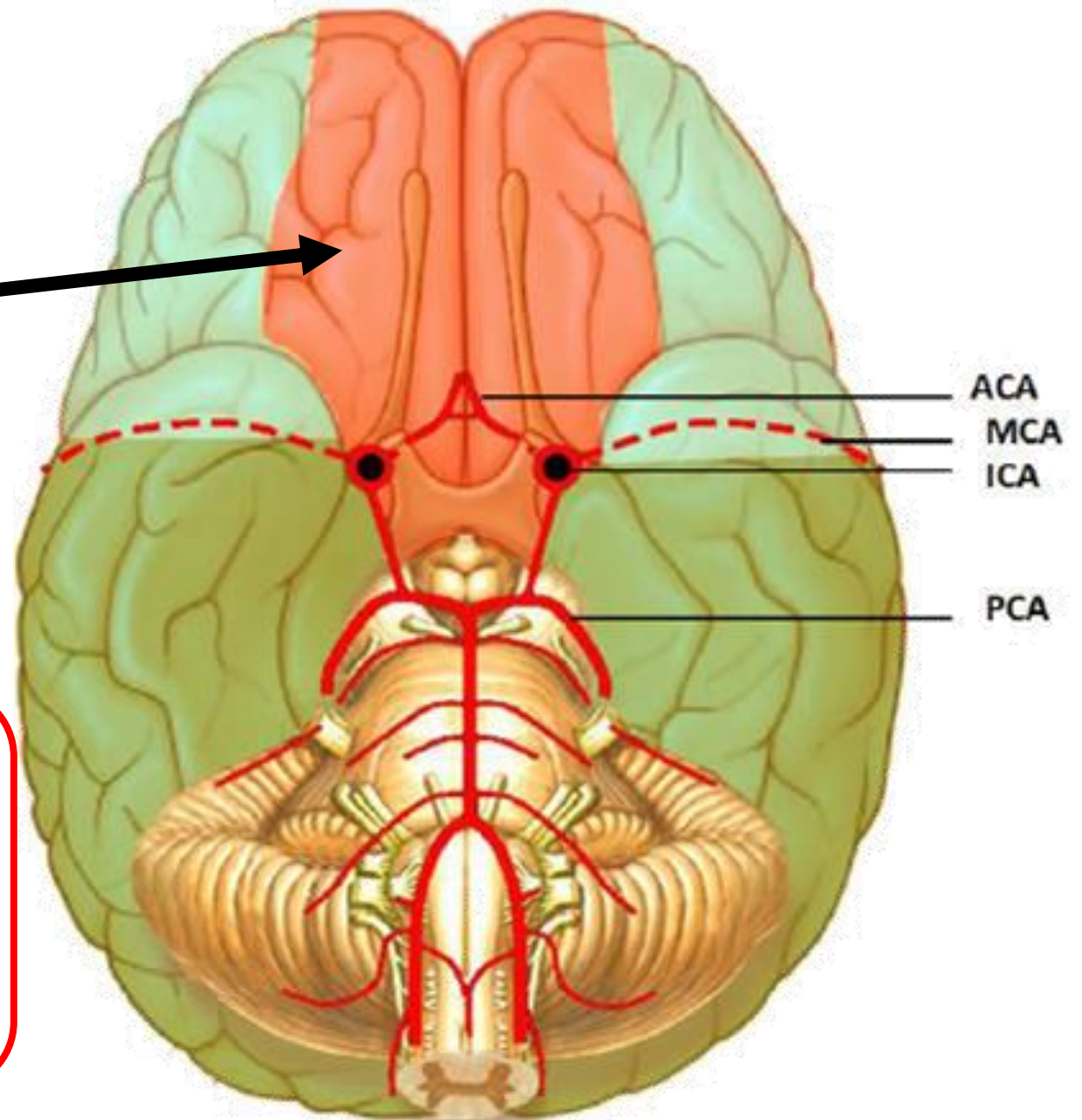
(ACA)

- **Medial surface** (All except occipital lobe supplied by PCA).
- 1-2 cm of **superolateral surface** of frontal & parietal lobes.



Inferior surface

- Medial part of orbital surface



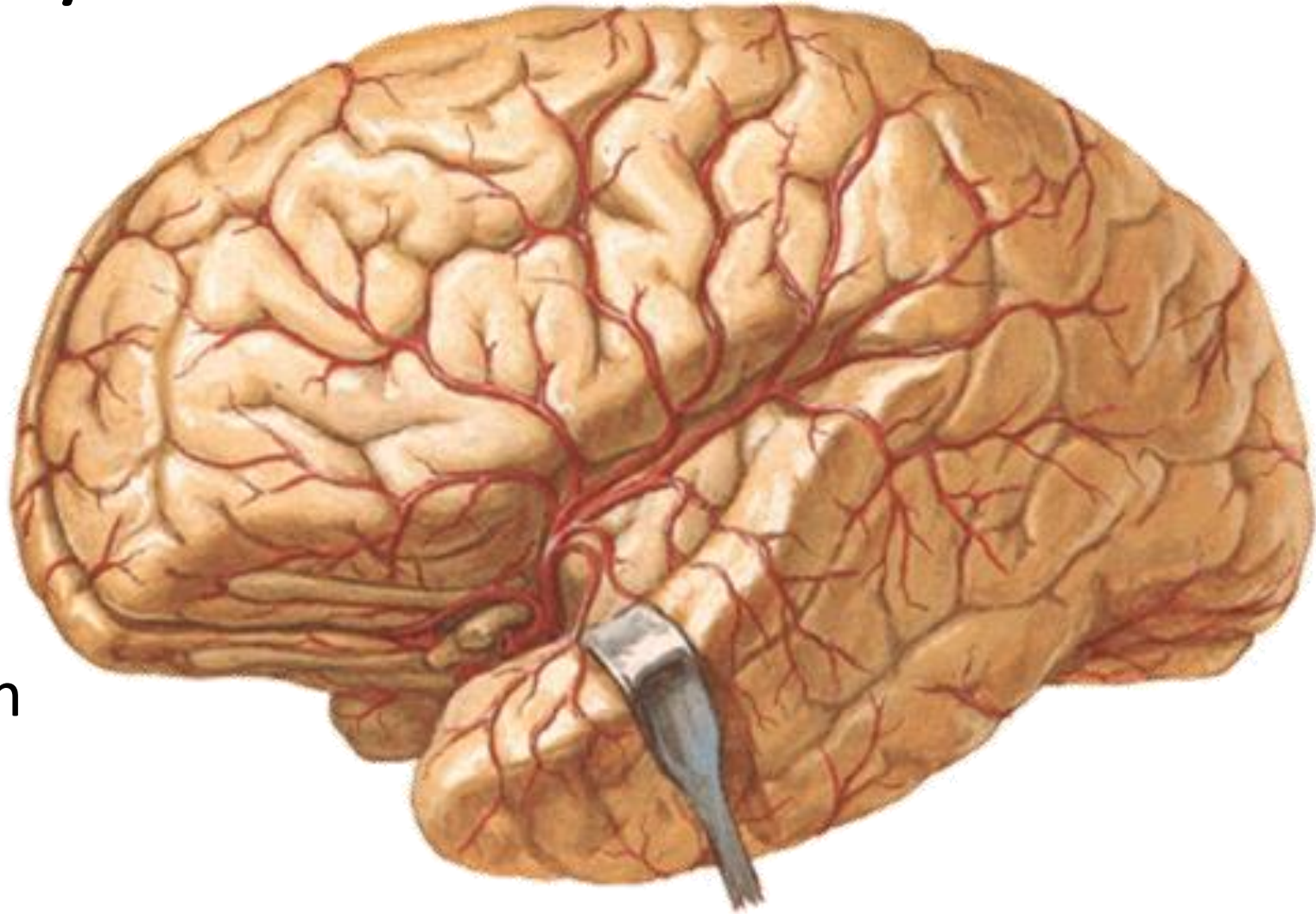
Applied anatomy: the ACA supplies the motor & sensory areas of the contralateral lower limb.

Inferior surface

Middle cerebral artery

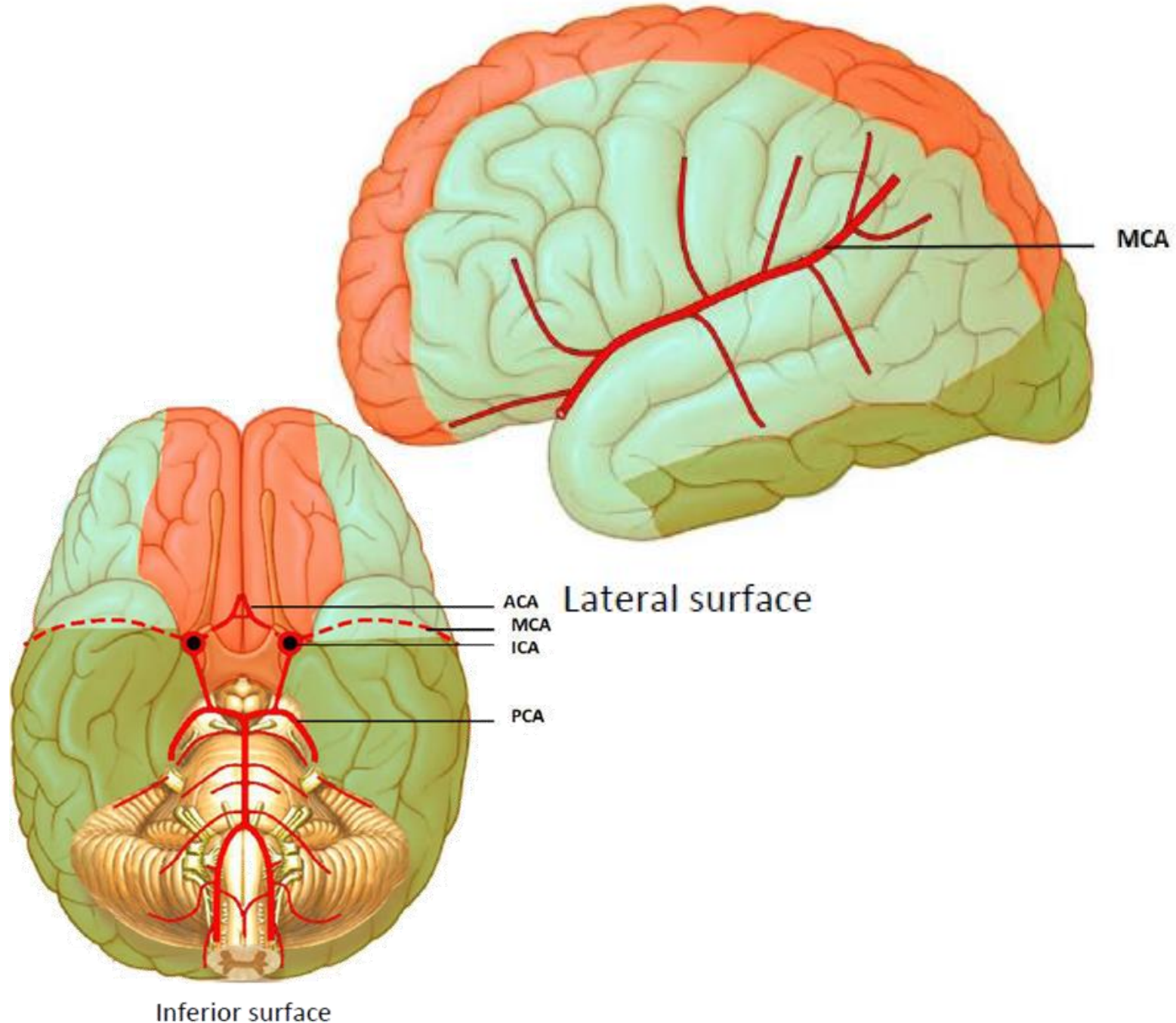
MCA

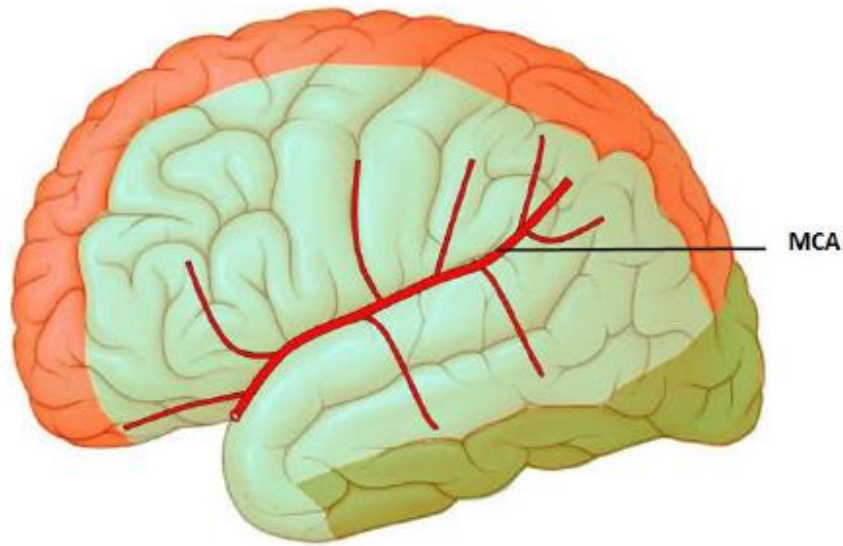
- **Origin:**
It is the larger terminal branch of internal carotid artery
- **Course:**
It runs in the lateral Sulcus crossing the insula to reach the superolateral surface



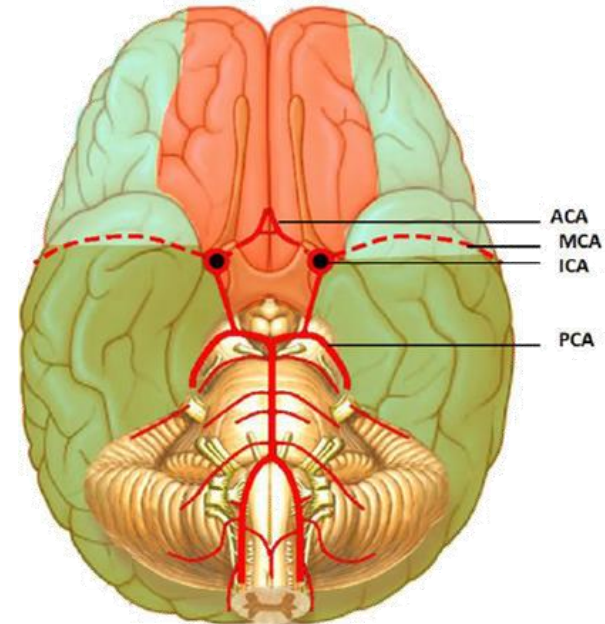
Distribution

- **Lateral surface**
(a large area except occipital lobe + a strip along superior border + a strip along inf. border).
- **Inferior surface**
(lateral part of orbital surface + temporal pole)





Lateral surface



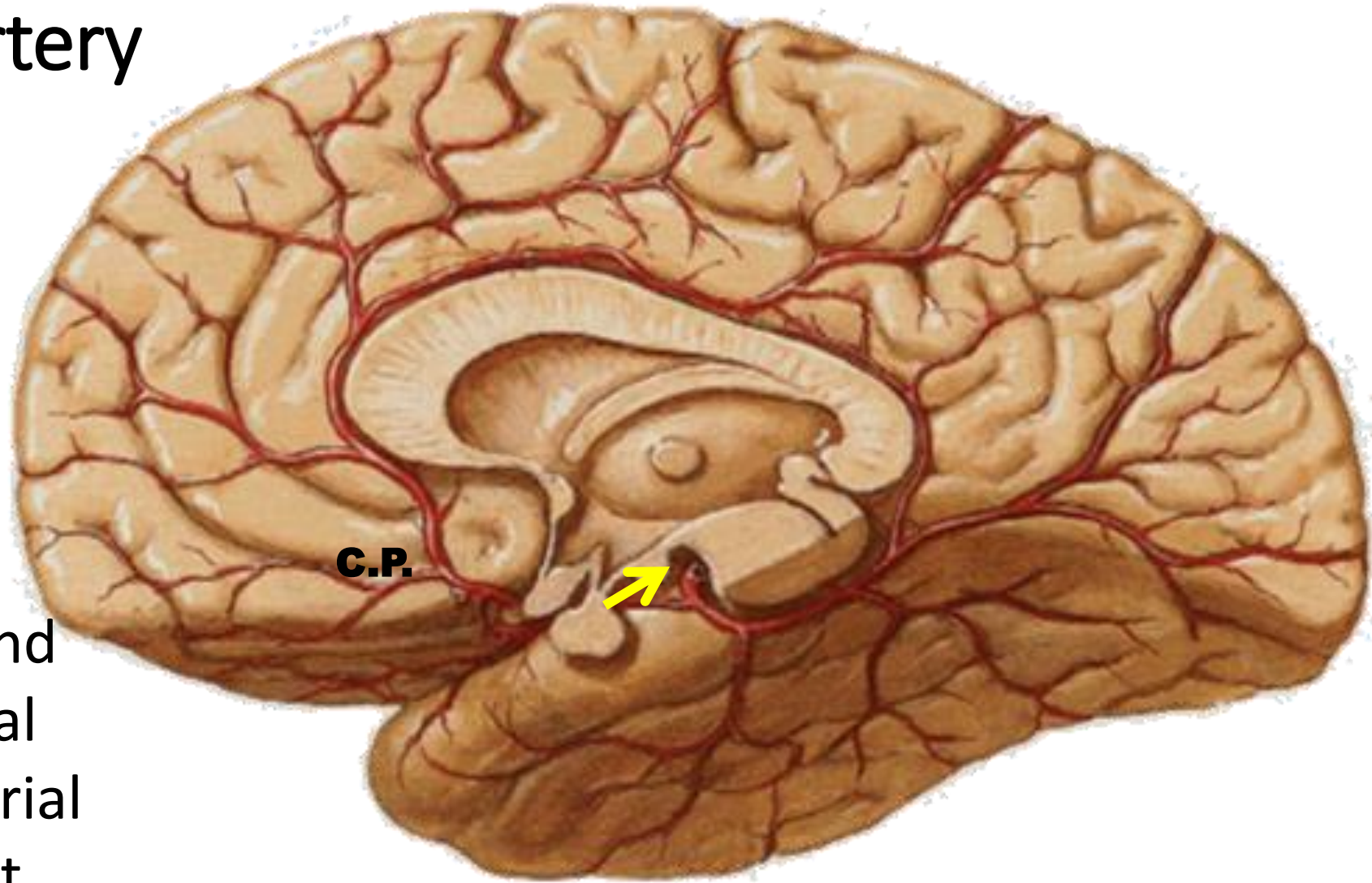
Inferior surface

Applied anatomy: the MCA supplies the motor & sensory areas of the **contralateral upper limb ,trunk and face + speech** (in dominant hemisphere) & **auditory areas** + frontal eye field. Its thrombosis is very serious & if occurs on the dominant side **aphasia** occurs.

Posterior cerebral artery

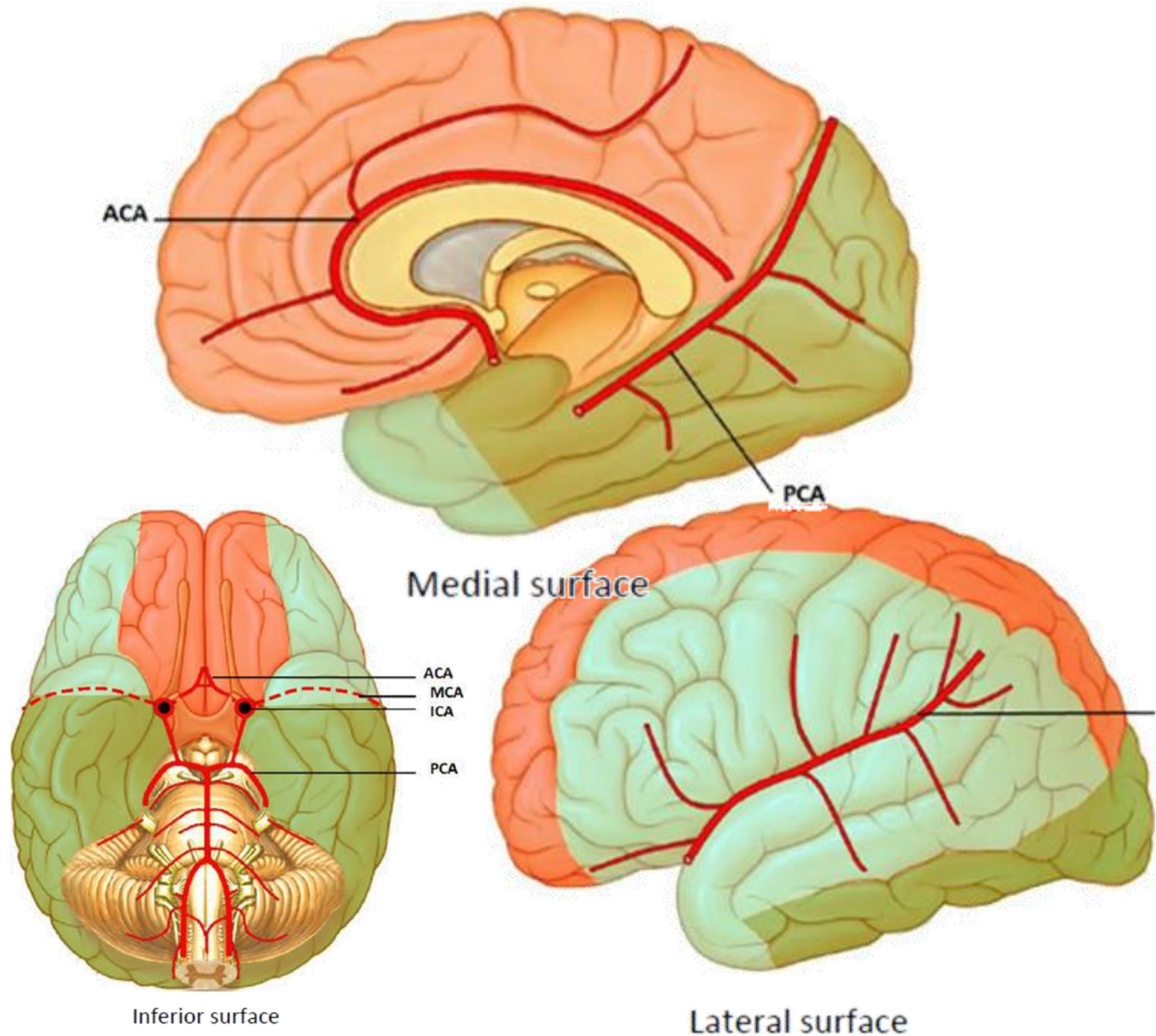
PCA

- **Origin:**
The terminal branch of basilar artery.
- **Course:**
It receives the posterior communicating artery and turns around the cerebral peduncle to reach Tentorial surface of brain, where it breaks into cortical branches.

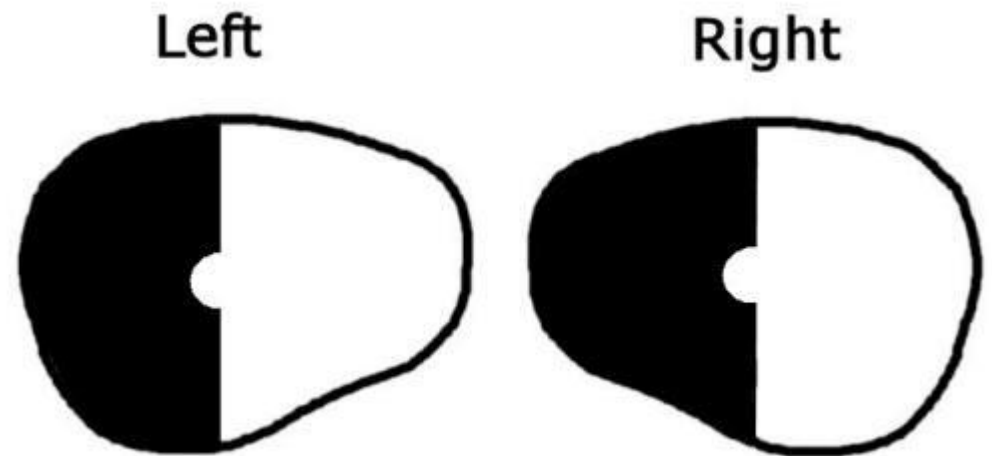


Distribution

- **Lateral surface** (occipital lobe+ strip along lower border of hemisphere).
- **Medial surface** (occipital lobe)
- **Inferior surface** (tentorial part except temporal pole)



Applied anatomy: the PCA supplies the visual areas of the contralateral $\frac{1}{2}$ of both visual fields. Its occlusion leads to **homonymous hemianopia** but there is **macular sparing** because the branches supplying the macular region have strong anastomosis with the **MCA**



Venous drainage of the Brain

- **Superficial (external) veins:**

 - Drain the cortical surfaces of the cerebral hemisphere**

- **Deep (internal) veins:**

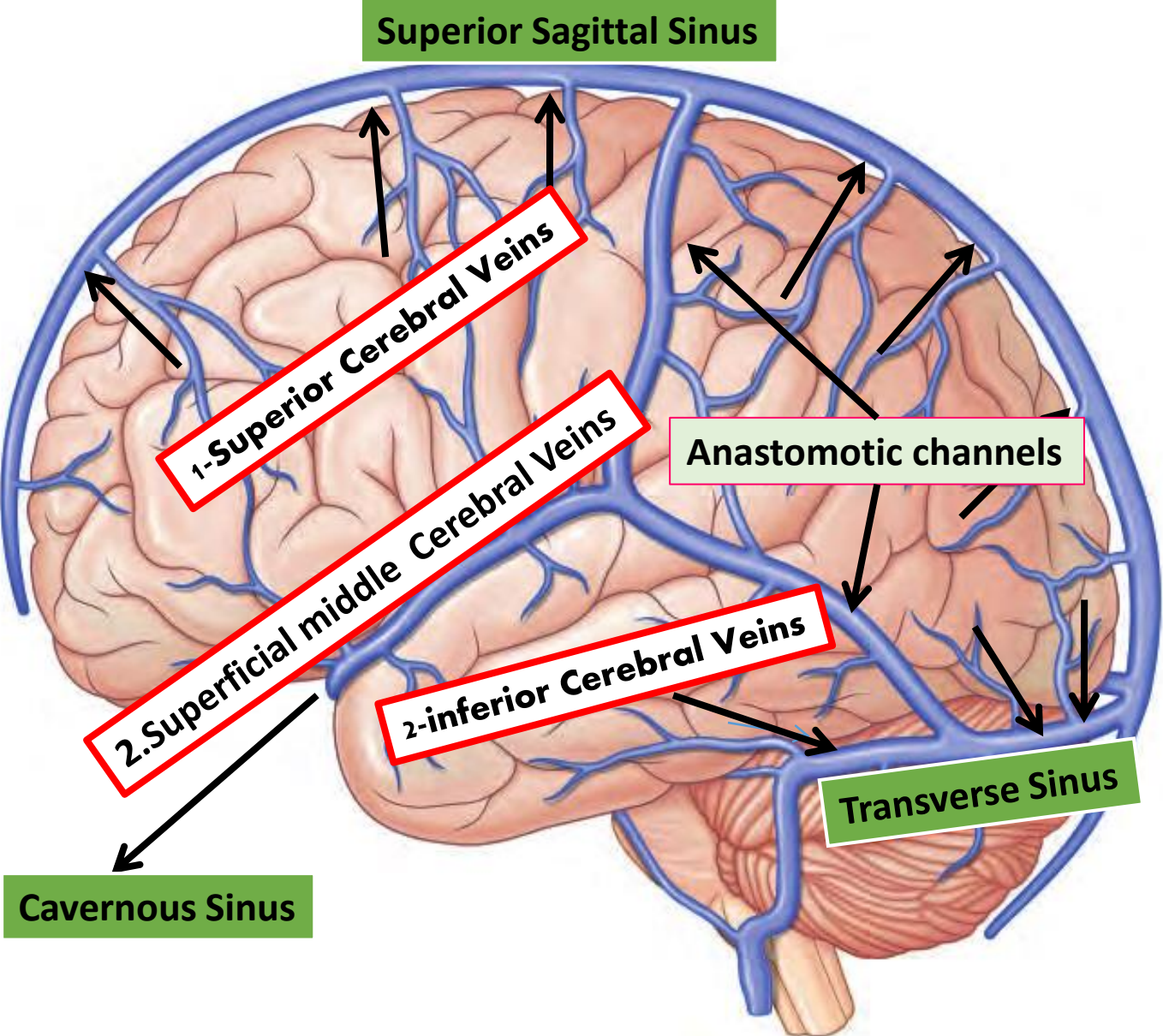
 - Drain the interior of the cerebral hemisphere.**

- **Veins emerge from the brain to the subarachnoid space then pierce the arachnoid and meningeal layer of dura to drain into cranial venous sinuses.**

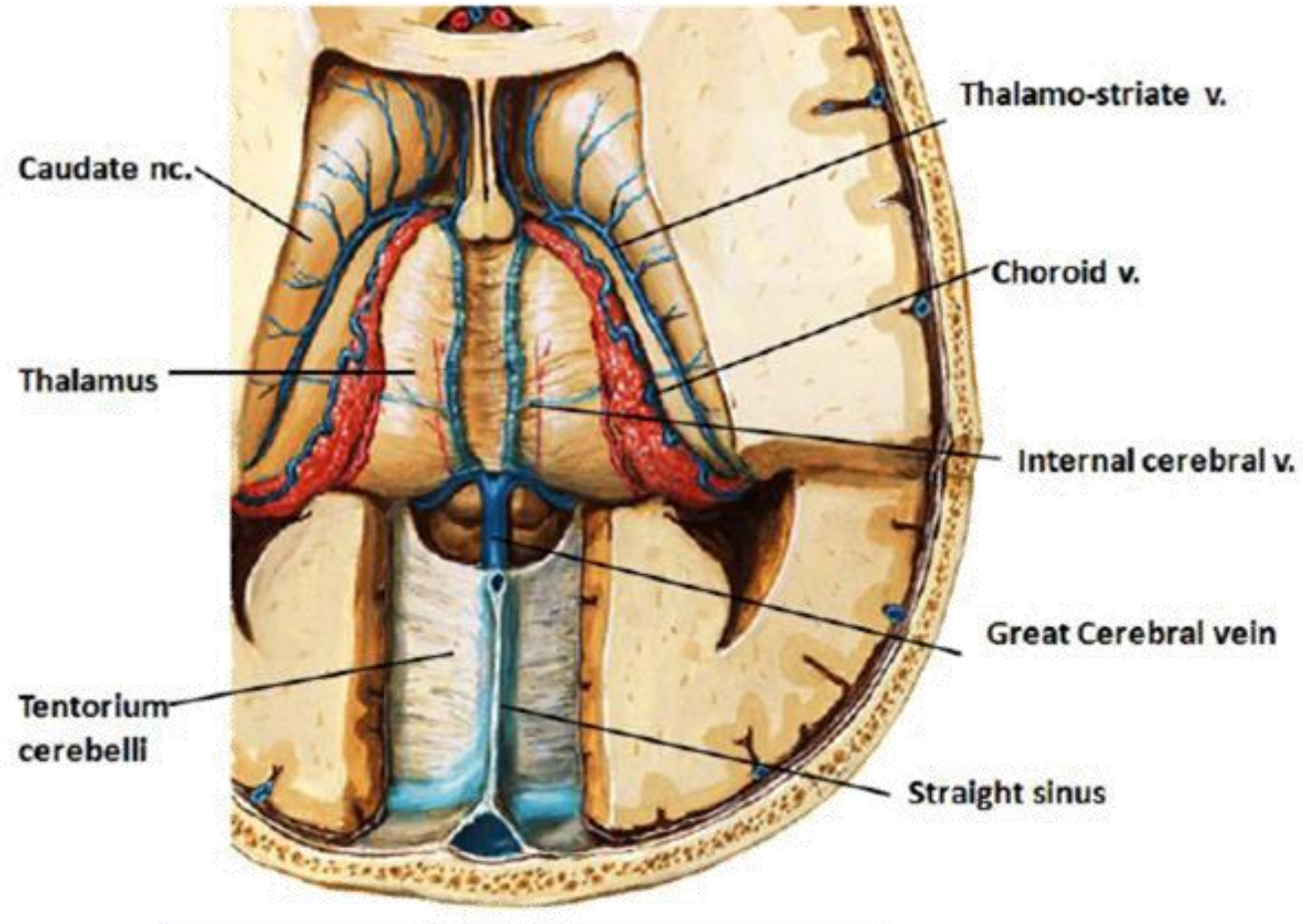
Superficial veins

3 Superficial veins

- 1. Superior Cerebral Veins
- 2. Superficial middle Cerebral Veins
- 3. inferior Cerebral Veins

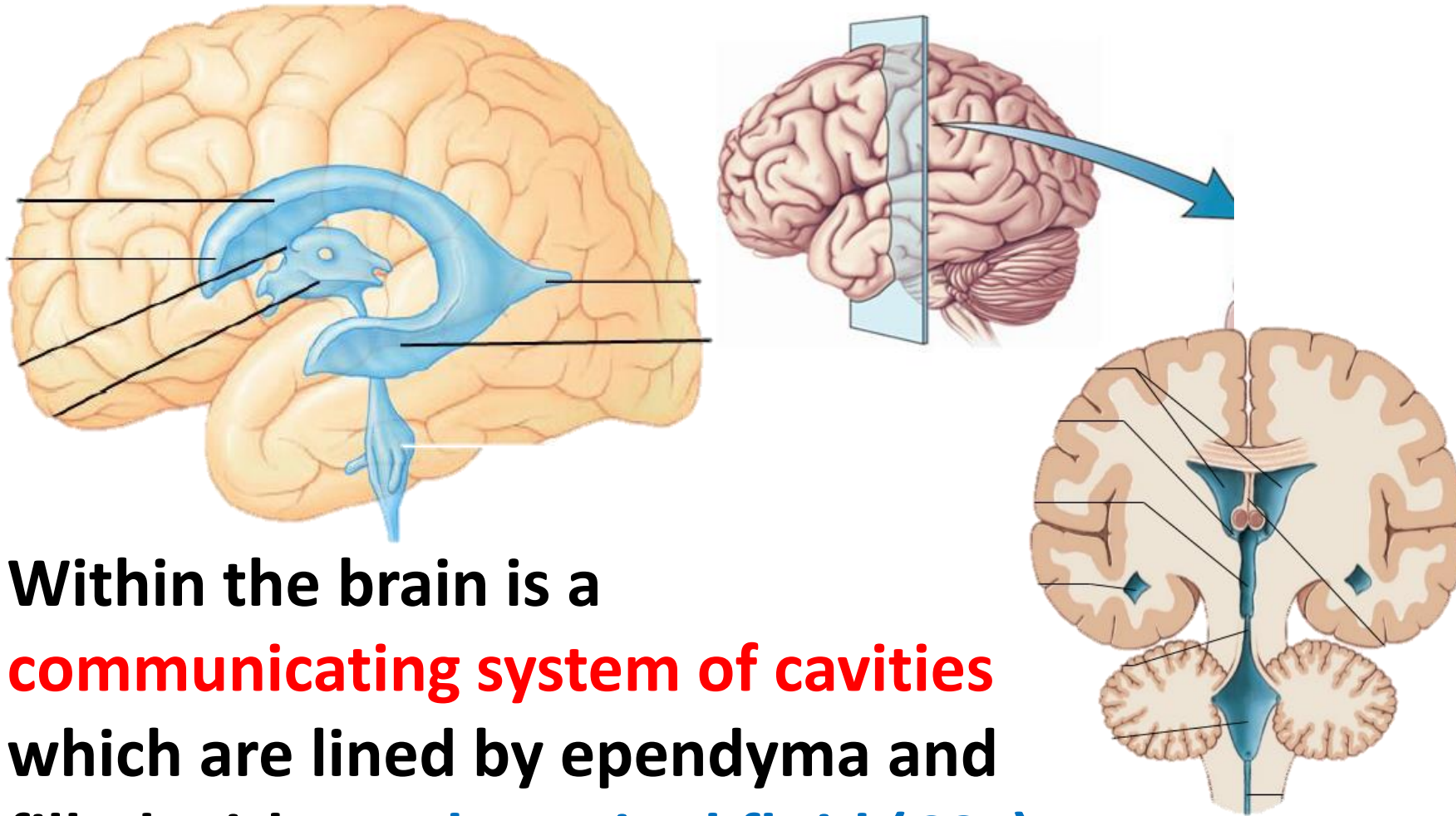


Deep Veins



- Thalamostriate vein + choroidal vein....**INTERNAL CEREBRAL VEIN**
- The (Rt. & Lt.) internal cerebral veins unite**GREAT CEREBRAL V.**
- Great cerebral vein (receives basal V.) + ISS..... **STRAIGHT SINUS.**

VENTRICULAR SYSTEM

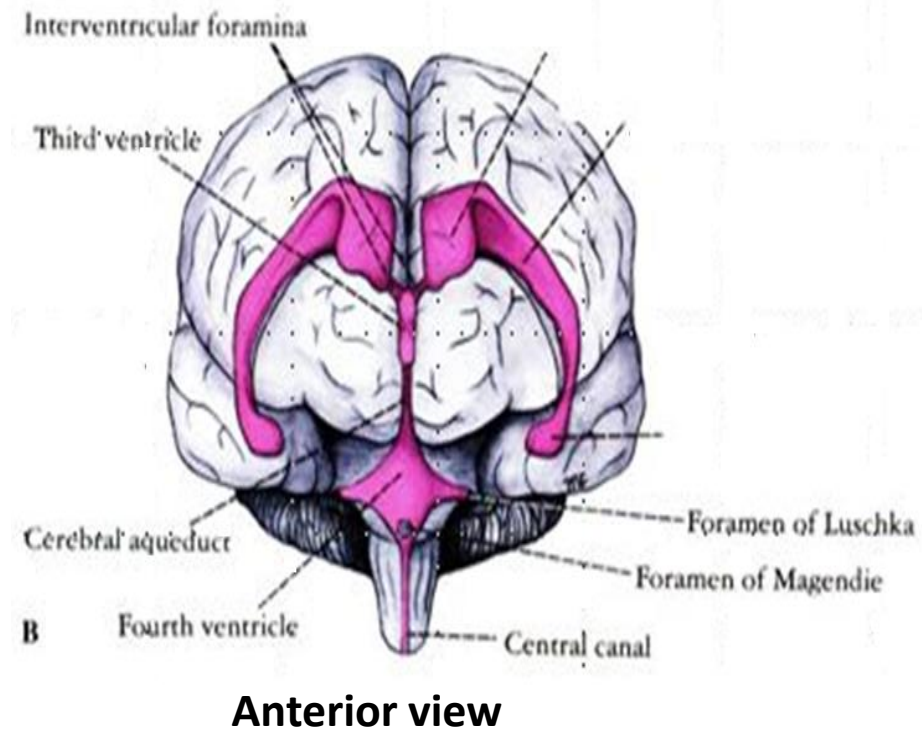
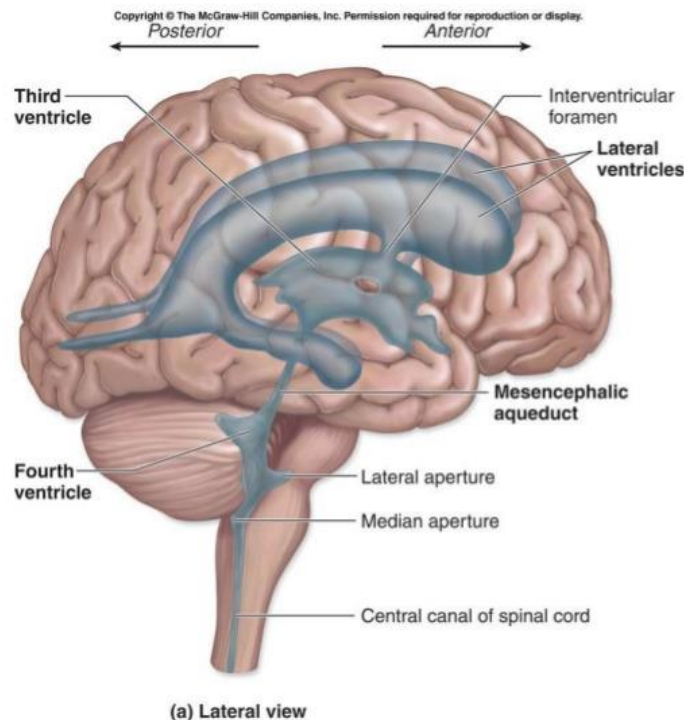


Within the brain is a **communicating system of cavities** which are lined by ependyma and filled with **cerebrospinal fluid (CSF)**.

VENTRICULAR SYSTEM

The cavities include :

1. the two lateral ventricles(cavity of telencephalon)
2. the third ventricle (cavity of diencephalon)
3. the fourth ventricle (cavity of rhombencephalon)



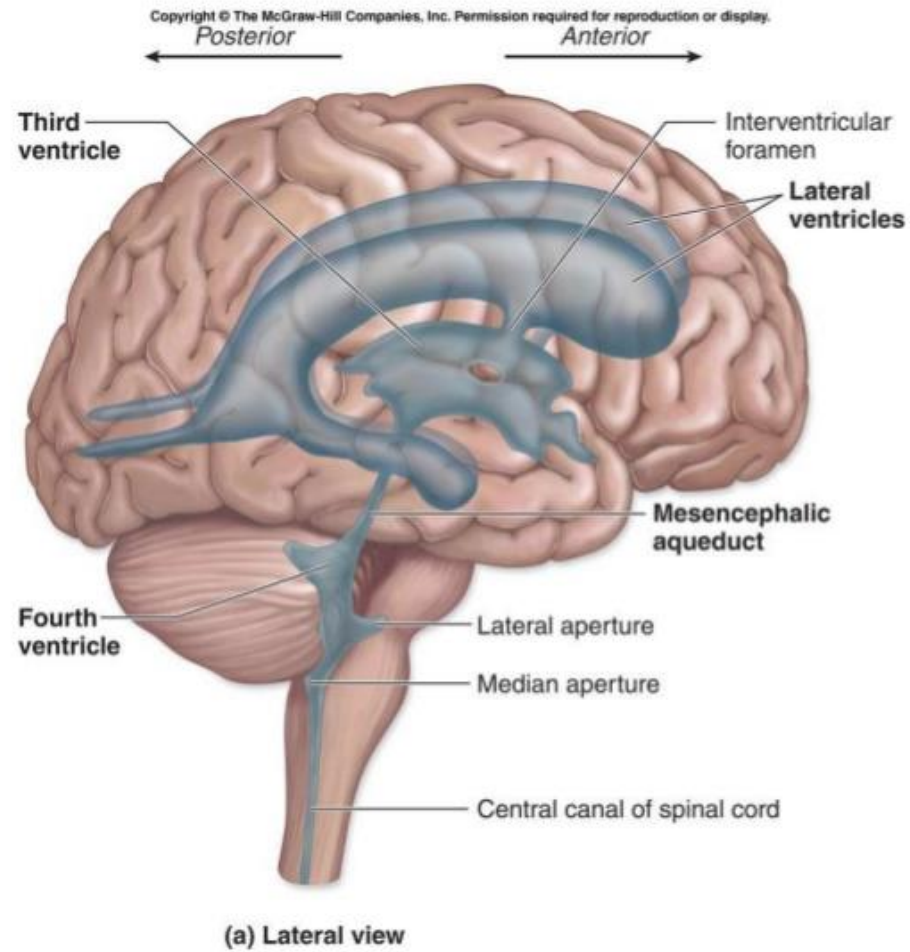
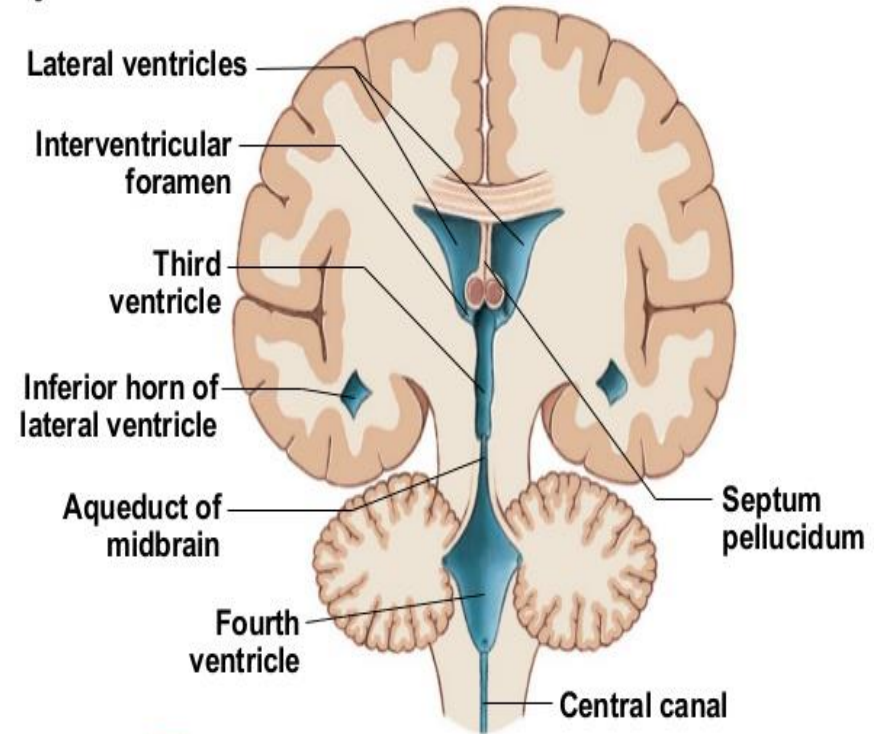


Figure 16.2d Ventricles of the Brain

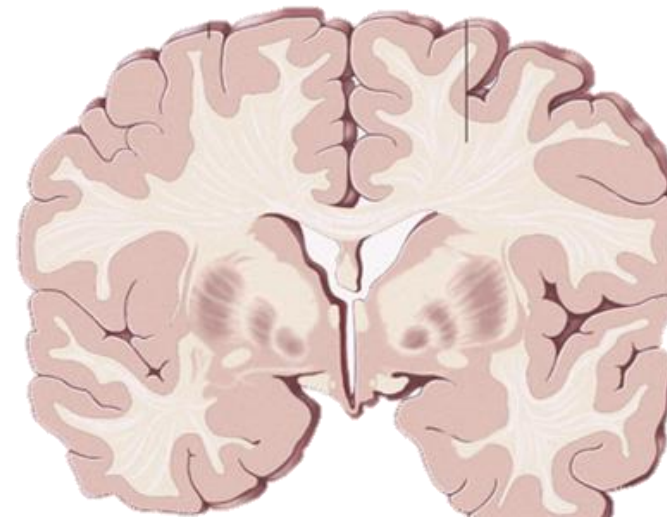
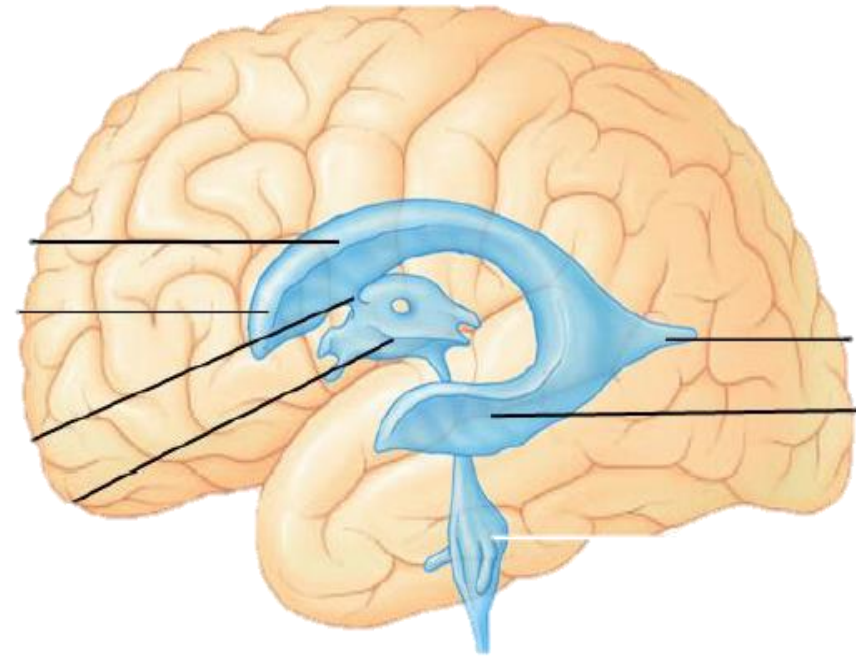


d Diagrammatic coronal section showing the interconnections between the ventricles

Lateral Ventricle

Definition:

- It is the largest brain ventricle.
- **The right and left** lateral ventricles are the cavities of the cerebral hemispheres (telencephalon).
- It is connected with the 3rd ventricle by the **interventricular foramen (of Monro)**

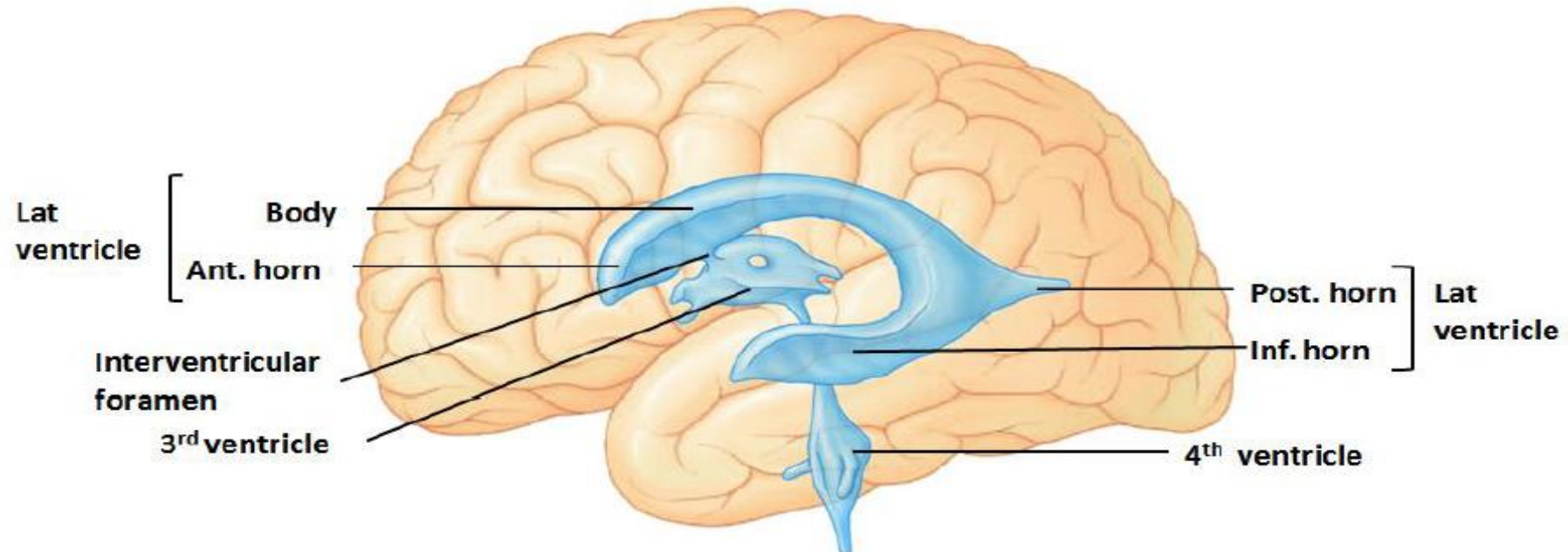


Lateral Ventricle

Parts:

Each lateral ventricle is a roughly **C-shaped, having**

1. a **body**,
2. an **anterior horn** that projects into the frontal lobe,
3. a **posterior horn** that projects into occipital lobe
4. and an **inferior horn** that extends into temporal lobe

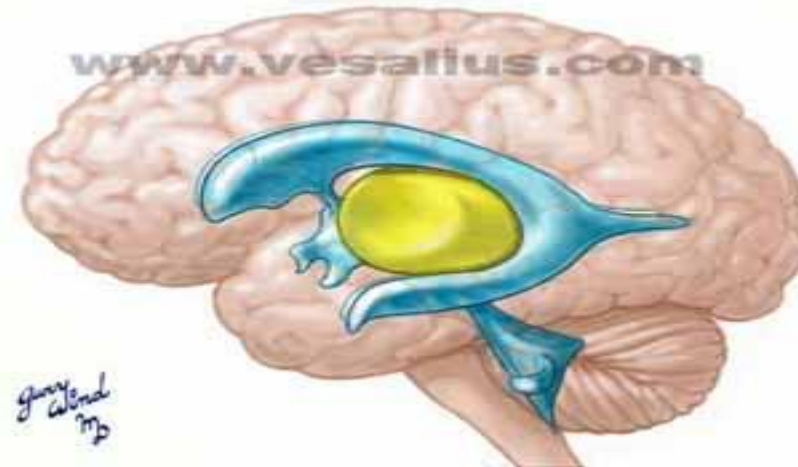
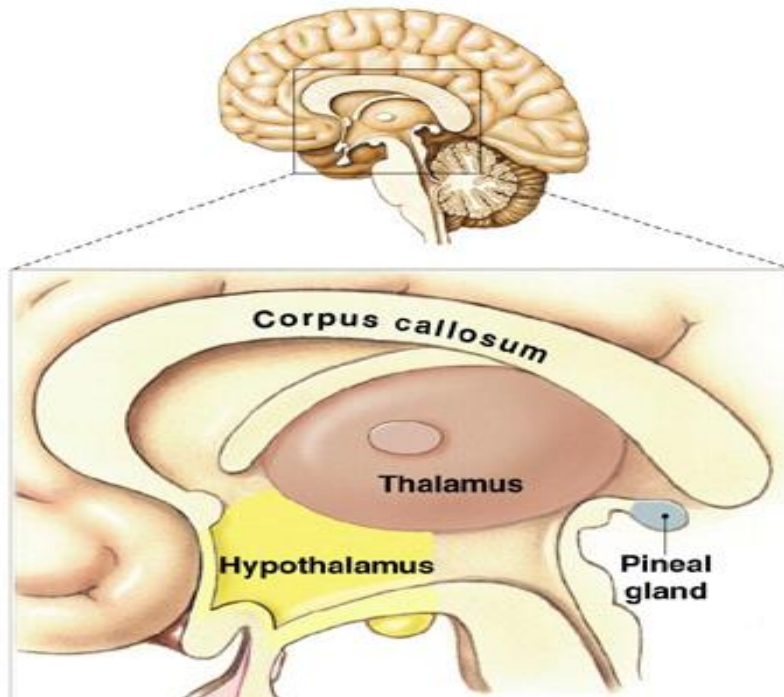


Body of the lateral ventricle

Extends **from** the interventricular foramen **till** the posterior end of the thalamus .

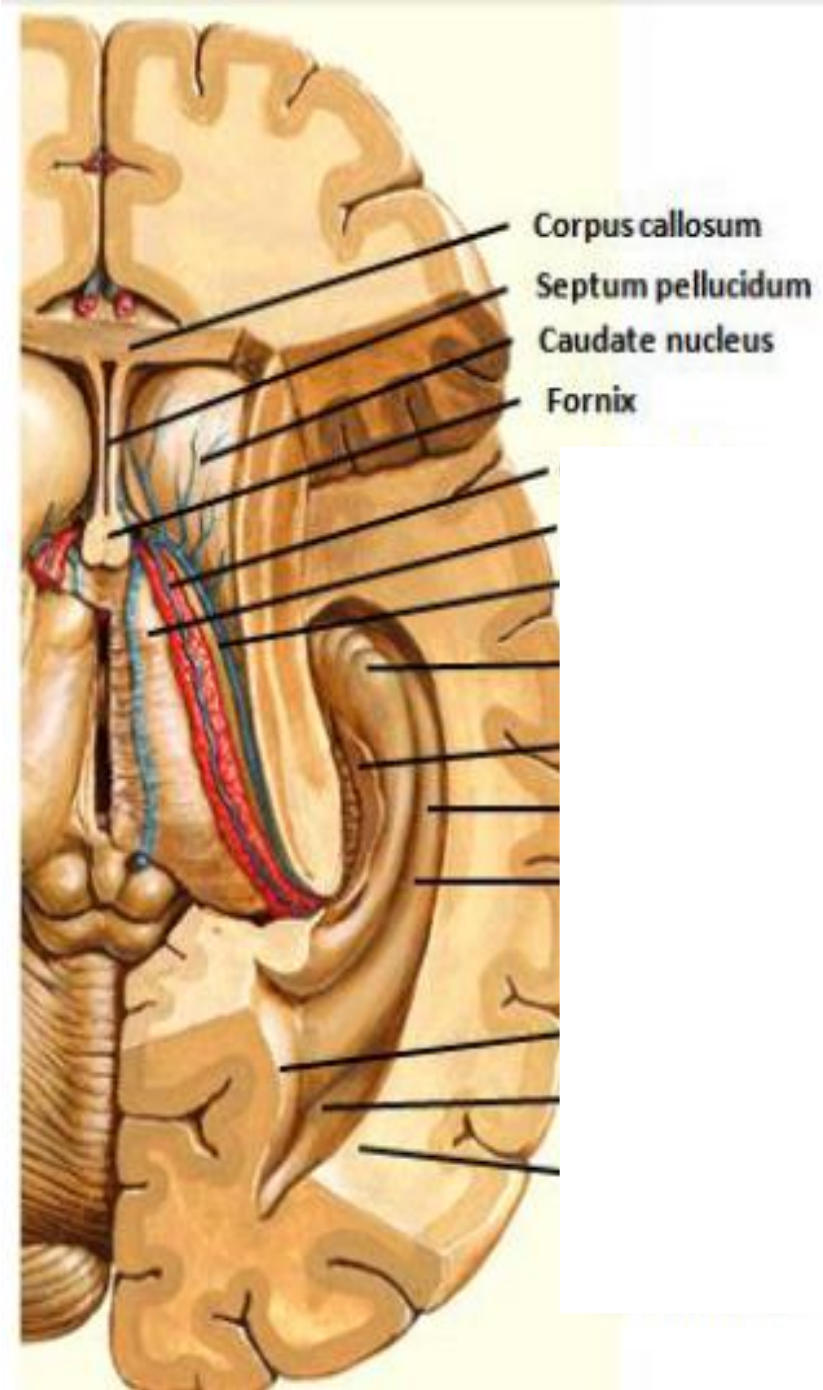
Boundaries: it has a roof, a floor, and a medial wall.

- The **roof** is formed by the **corpus callosum**.
- The **floor** is formed by:
 1. The body of the **caudate nucleus**
 - 2 **The thalamus** .
- The **medial wall** is formed anteriorly by the **septum pellucidum** .



- **NB:**

The choroid plexus of the lateral ventricle present in its body and inferior horn.

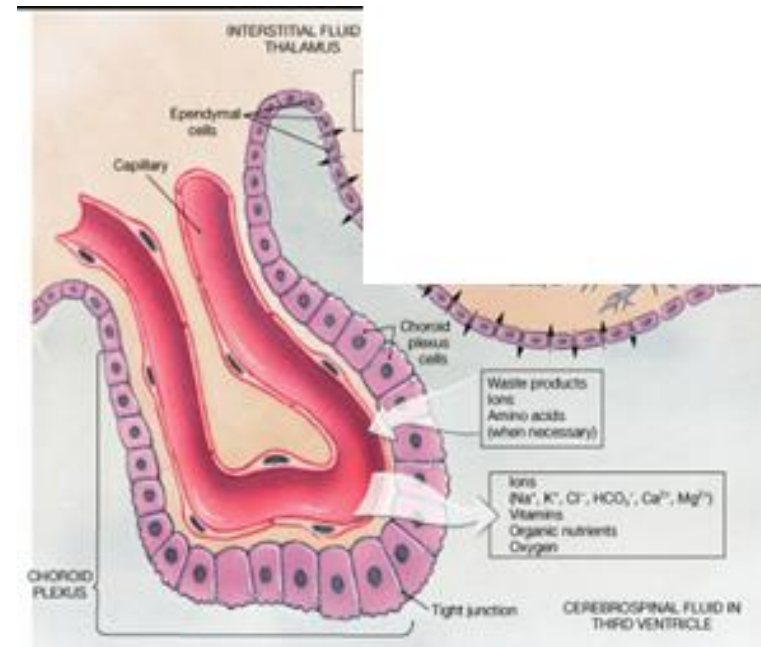


choroid plexuses of the ventricles

The pia mater + blood vessels + ependyma form the **choroid plexuses of the ventricles**

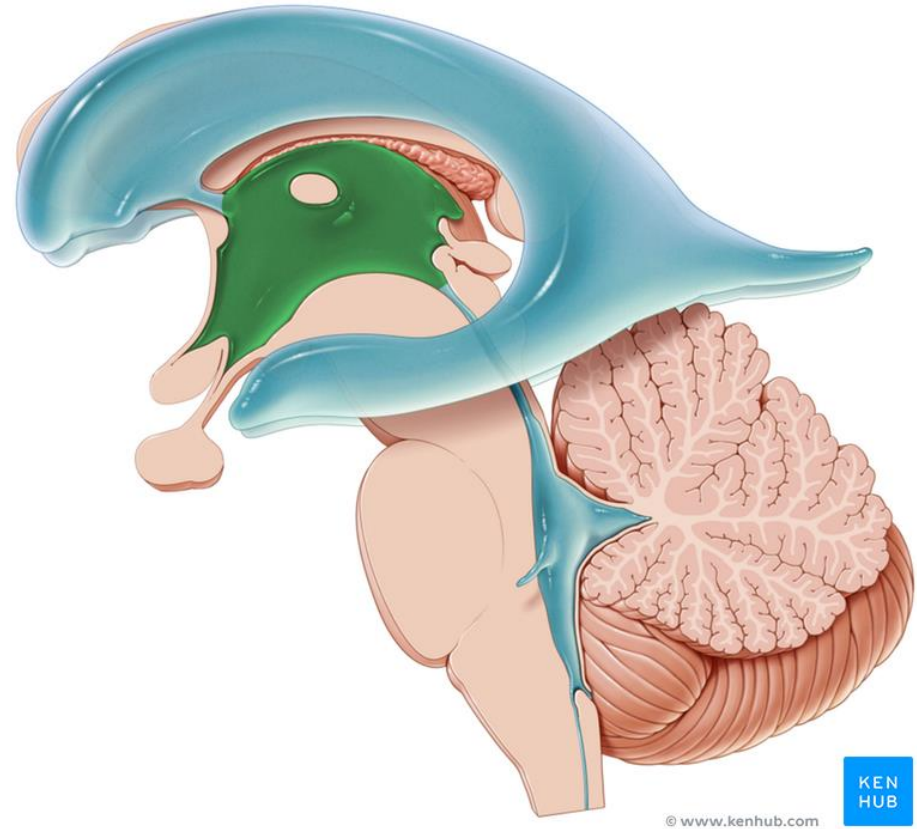
Ependyma: simple cuboidal epithelium which lines the ventricles

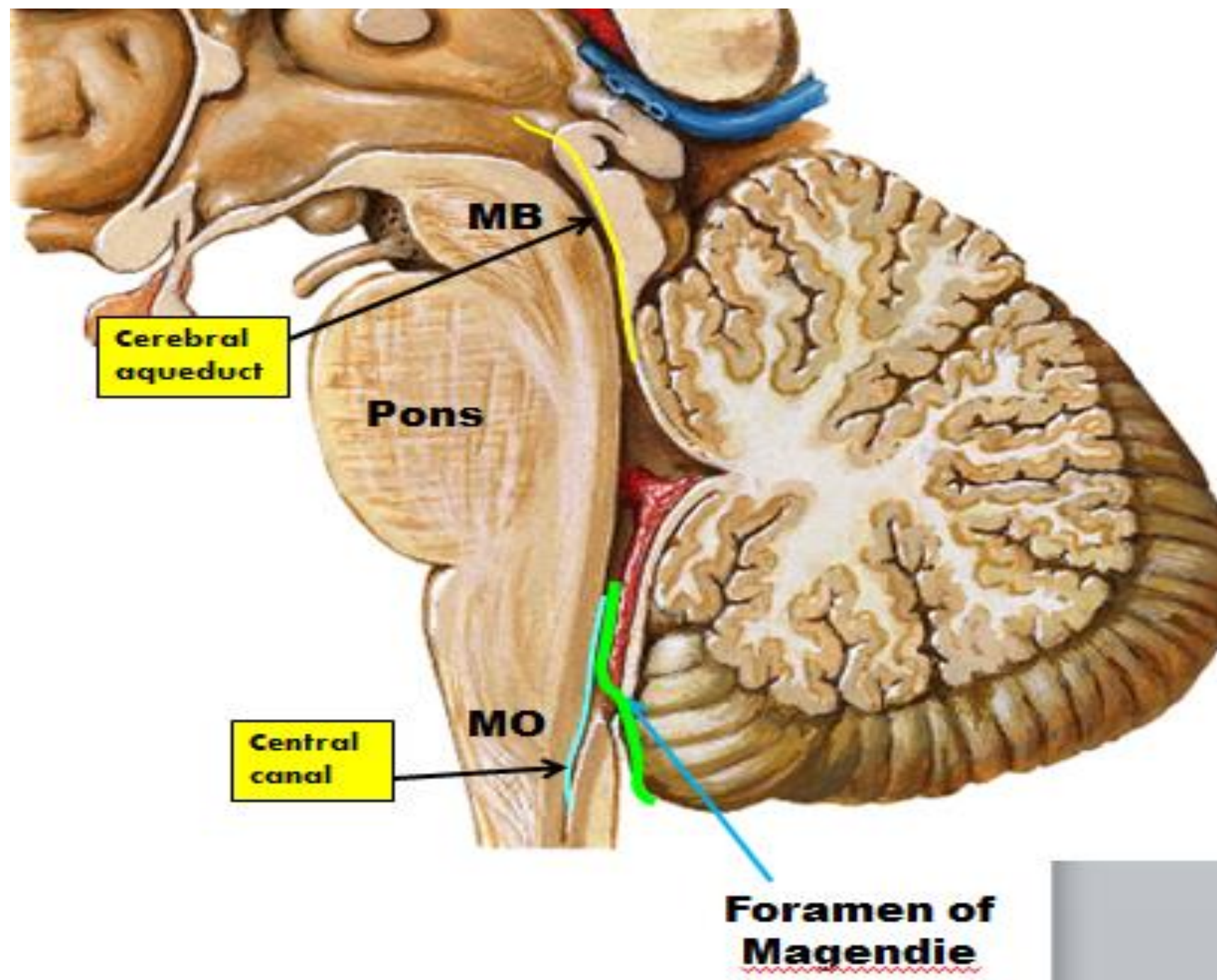
The choroid plexuses are formed by: invagination of the vascular **pia** into the **lumen of the ventricles**,



Circulation:

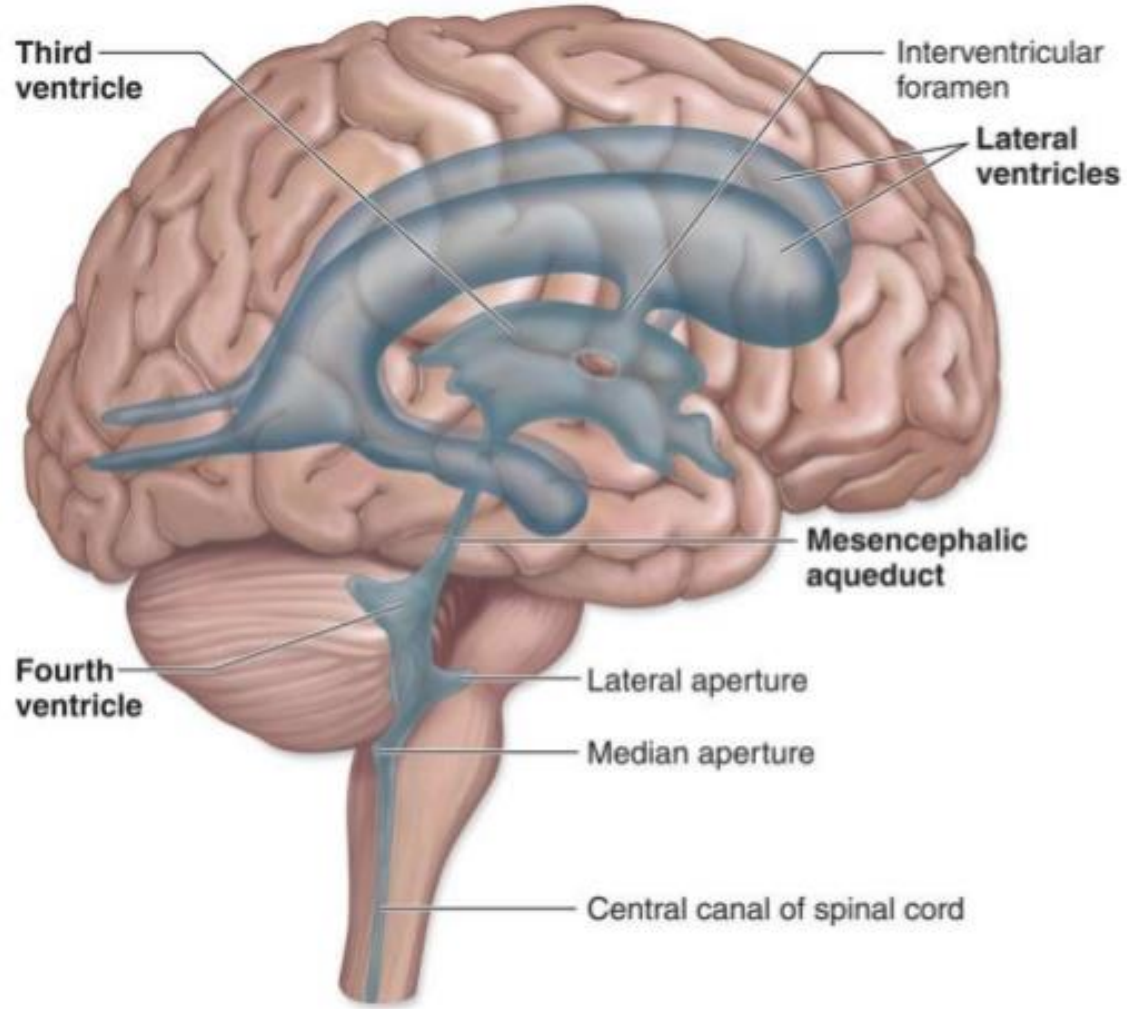
FROM THE Lateral ventricles ... by interventricular foramen to **the third ventricle** by.... aqueduct of Sylvius to the **fourth ventricle** through the median foramen (of Magendie) & the two lateral foramina (of Luschka) to the ...**subarachnoid space**. From here it flows in subarachnoid space around brain or around spinal cord.



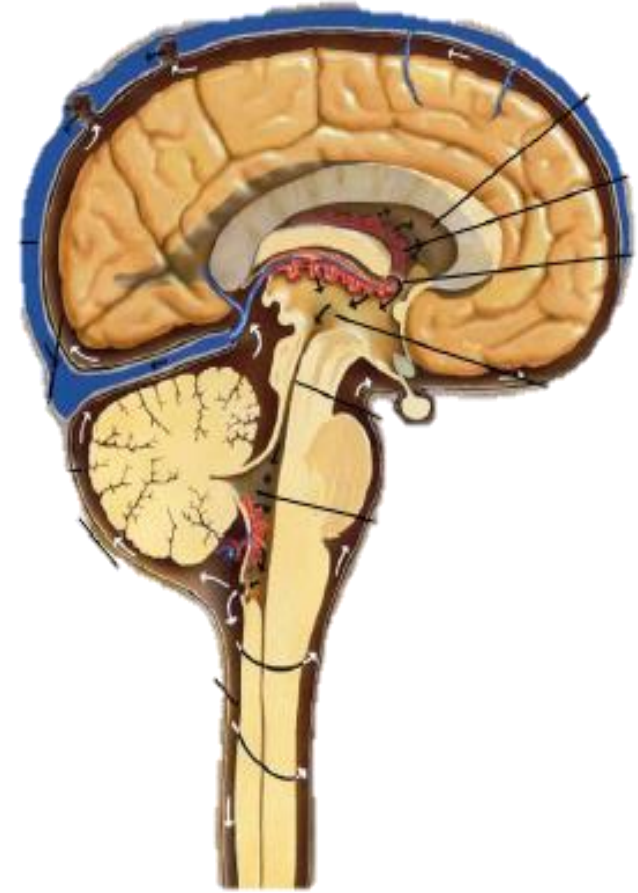


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Posterior Anterior



(a) Lateral view



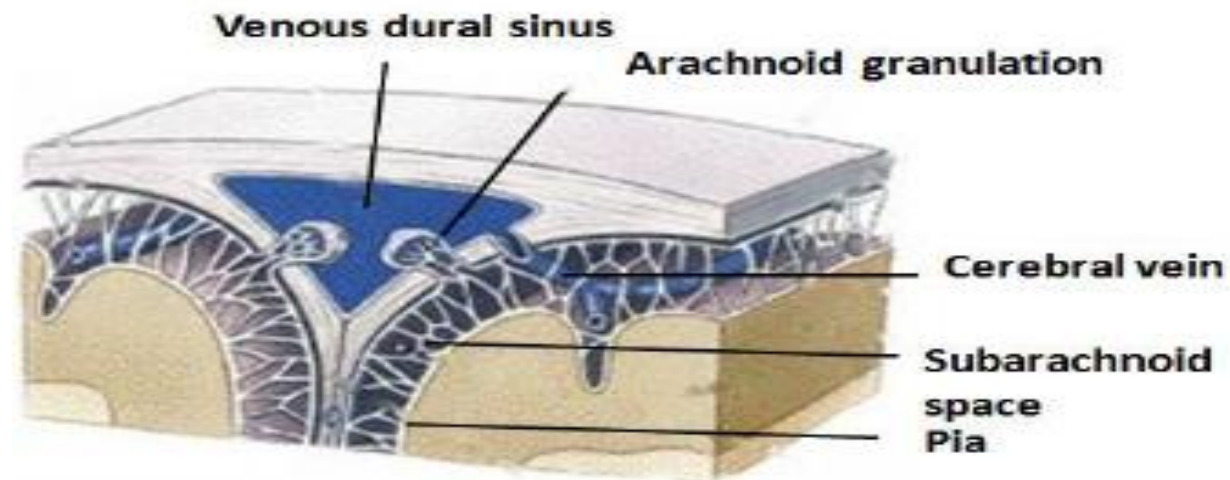
Absorption:

Mostly through **arachnoid villi and granulations** into the **dural venous sinuses** especially the superior sagittal sinus.

- The space between arachnoid and pia is called **subarachnoid space**.

The **subarachnoid space** contains CSF and the arteries supplying the brain.

- The outer surface of the arachnoid forms at certain sites the **arachnoid villi** and **granulations** through which CSF passes to the venous sinuses.





**Predict what happen if the
amount of CSF increased
than normal?**

Hydrocephalus: An increase in the volume of CSF within the skull due to:

↑ formation or ↓ absorption or block in circulation of CSF.

This excess fluid compresses the brain.



MCQ

The following structure is related to the lateral ventricle :

A-Thalamus

B- cerebellum

C-Pineal gland.

D-Optic chiasma

E-Posterior perforated substance.

Thank you