
بسم الله الرحمن الرحيم

BLOOD SUPPLY TO BRAIN

By

DR. MAHVISH JAVED

Assistant professor, KGMC Peshawar

Introduction:

•The entire blood supply of the brain and spinal cord depends on two sets of branches from the dorsal aorta.

*The **vertebral arteries** arise from the subclaivian arteries

*The **internal carotid arteries** are branches of the common carotid arteries.

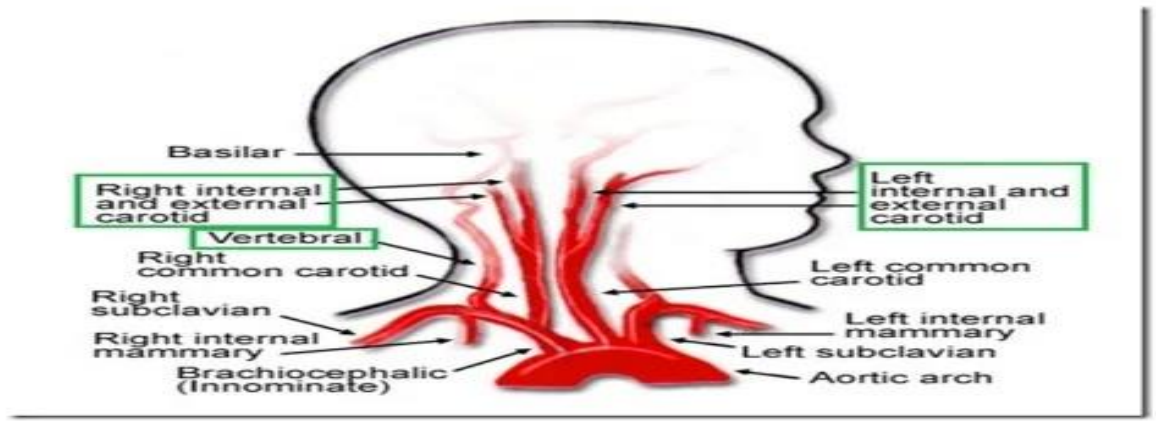
● The brain receives about 15 percent of the resting cardiac out put & accounts for 25 % of the body's O2 consumption.

10 seconds of brain ischemia → leads to unconsciousness

20 seconds of brain ischemia → ceases electrical activity of the brain.

3-4 minutes brain ischemia → leads to irreversible brain damage.

•

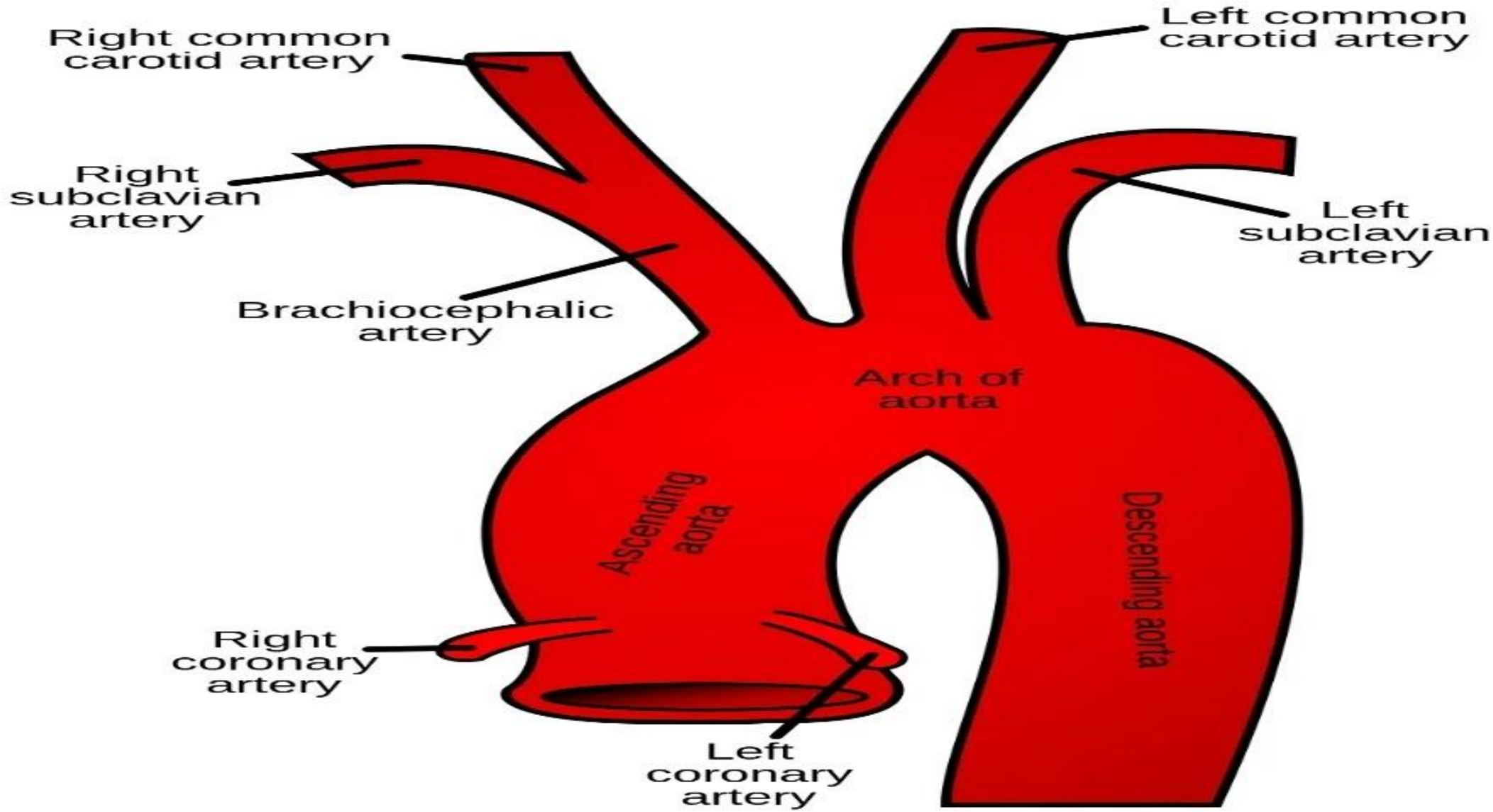


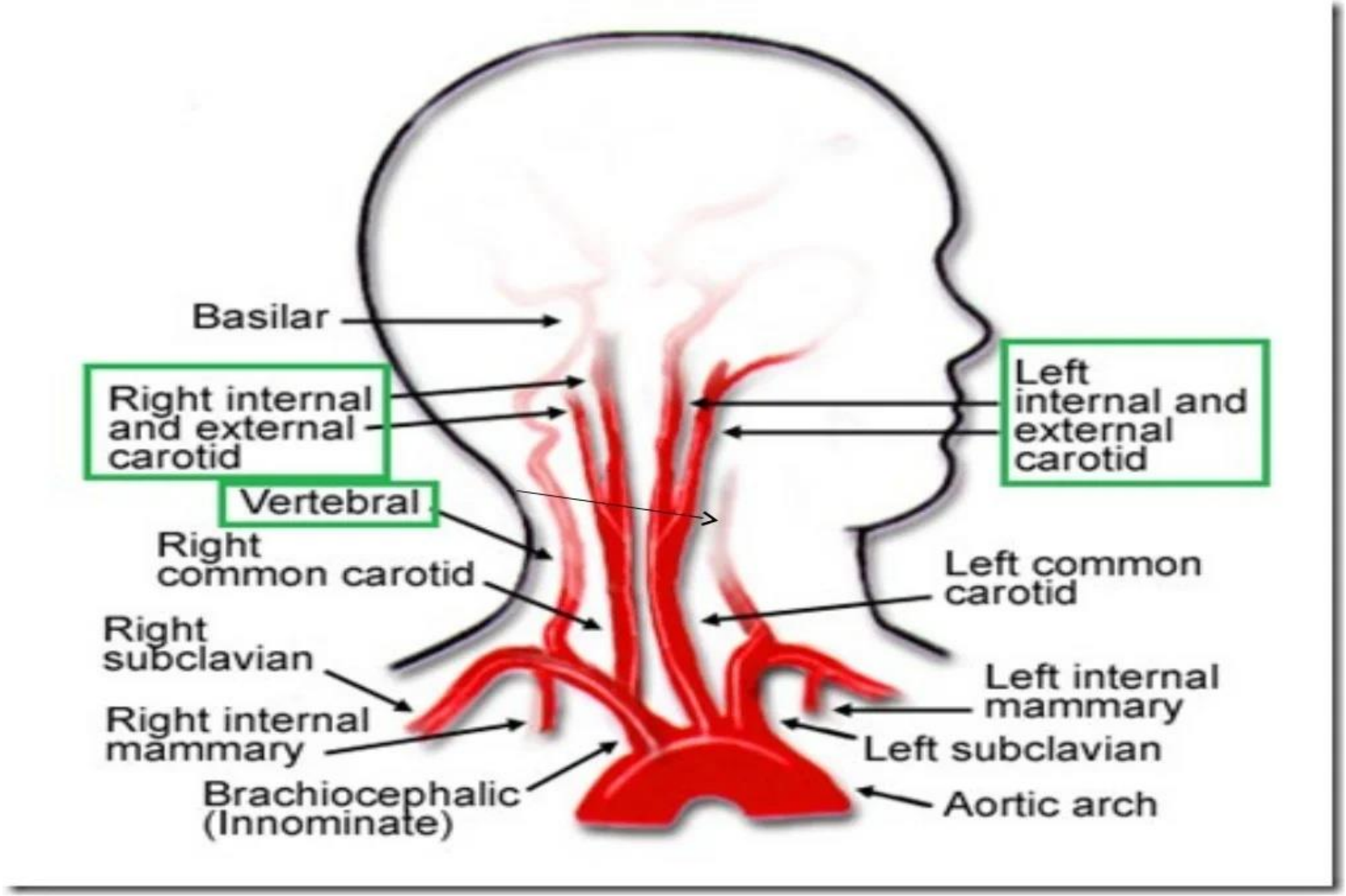
ARTERIAL SUPPLY TO THE BRAIN:

- The arterial blood reaches the brain through the pair of;

1-internal carotid arteries.{80% supply of telencephalon & diencephalon}

2-vertebral arteries.{20% supply to the brainstem & cerebellum alongwith some cortical regions}


Right common carotid artery
Left common carotid artery
Right subclavian artery
Left subclavian artery
Brachiocephalic artery
Arch of aorta
Ascending aorta
Descending aorta
Right coronary artery
Left coronary artery

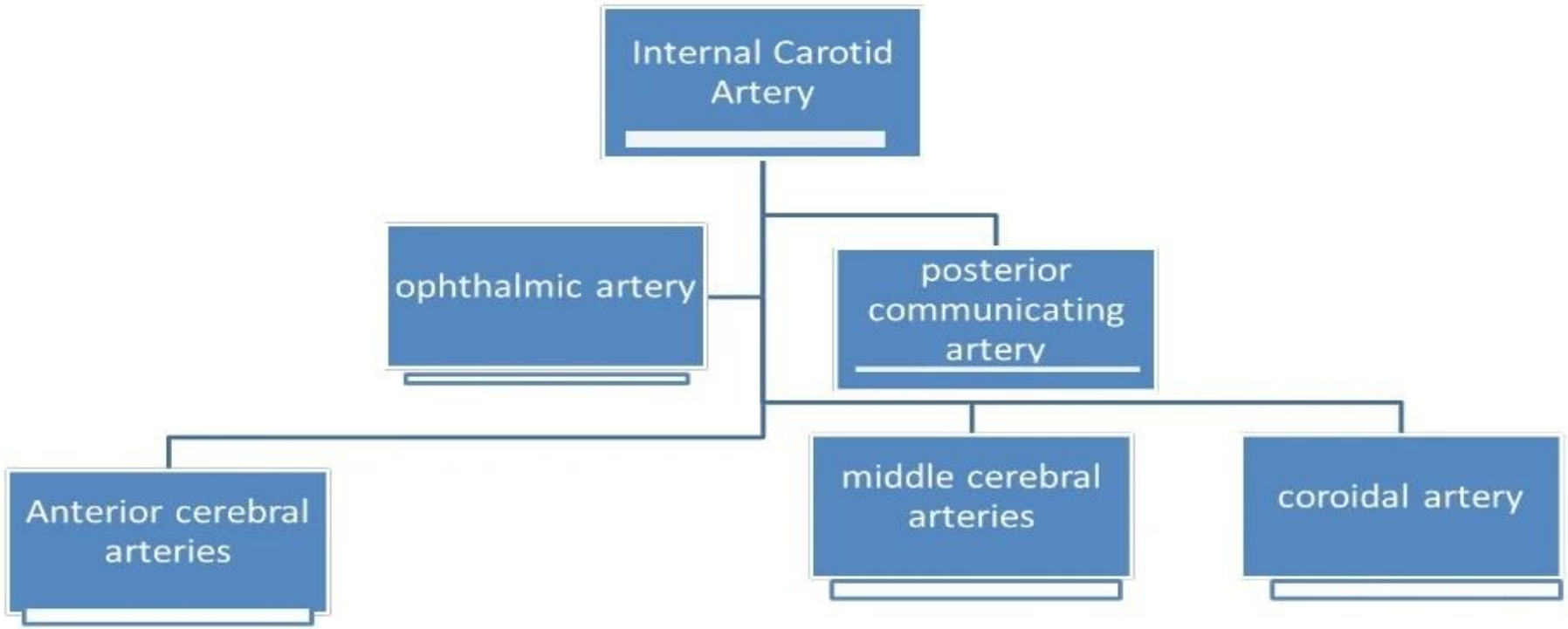

Basilar
Right internal and external carotid
Vertebral
Right common carotid
Right subclavian
Right internal mammary
Brachiocephalic (Innominate)
Left internal and external carotid
Left common carotid
Left internal mammary
Left subclavian
Aortic arch

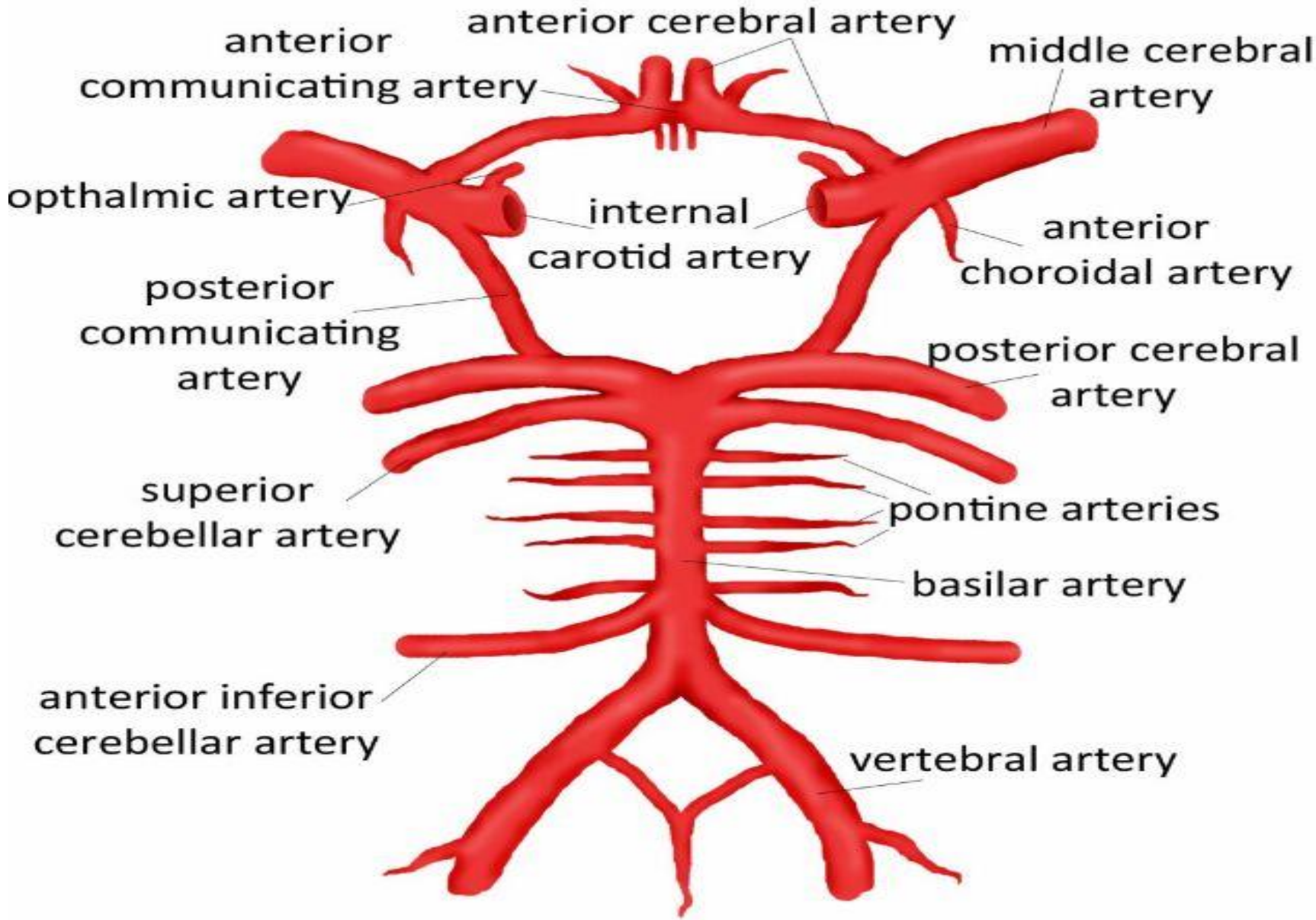
The internal carotid arteries:

It arise at the point in the neck (foramen lacerum) and enters into cavernous sinus where the common carotid arteries bifurcate into external & internal carotid arteries.

- ***External carotid artery*** supplies blood to the facial muscles.
- ***Internal carotid artery*** enters the cavernous sinus through the foramen lacerum enters the subarachnoid space by piercing the arachnoid mater and lies lateral to the optic chiasma.

BRANCHES OF INTERNAL CAROTID ARTERY




anterior cerebral artery
anterior communicating artery
middle cerebral artery
opthalmic artery
internal carotid artery
anterior choroidal artery
posterior communicating artery
posterior cerebral artery
superior cerebellar artery
pontine arteries
basilar artery
anterior inferior cerebellar artery
vertebral artery

Various Branches of Internal Carotid Artery:

- The internal carotid arteries branch to form two major cerebral arteries, the *anterior* and *middle cerebral arteries*
- As it leaves the cavernous sinus it gives rise to the ophthalmic artery & bifurcates into anterior & middle cerebral arteries
- It also gives rise to
- a) anterior coroidal artery
- b) posterior communicating artery.

1) Ophthalmic artery:

It passes into the orbit through the optic foramen. It supplies the structures of the orbit, frontal part of the scalp and dorsum of the nose.

2) Anterior choroidal artery:

It supplies the optic tract, choroid plexus of the lateral ventricle, hippocampus and some of the deep structures of the hemisphere, including the internal capsule.

3) Posterior communicating artery:

It passes posteriorly inferior to the optic tract & joins the posteior cerebral artery with the middle cerebral artery.

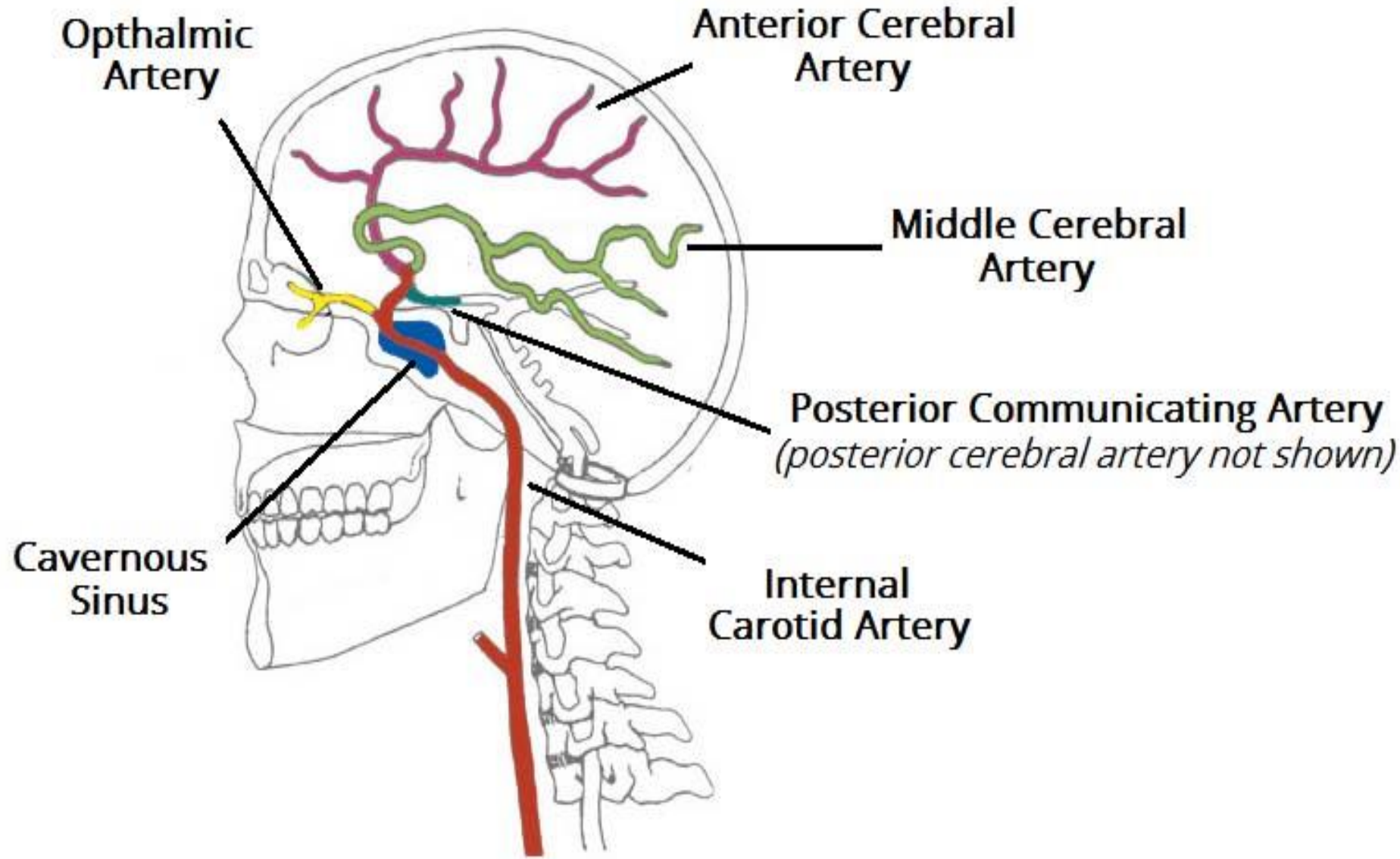
- **4) Anterior cerebral artery:**

It passes medially above the optic nerve and then passes into the great longitudinal fissure between the frontal lobes where it joins the corresponding vessels of the opposite side by *anterior communicating artery*.

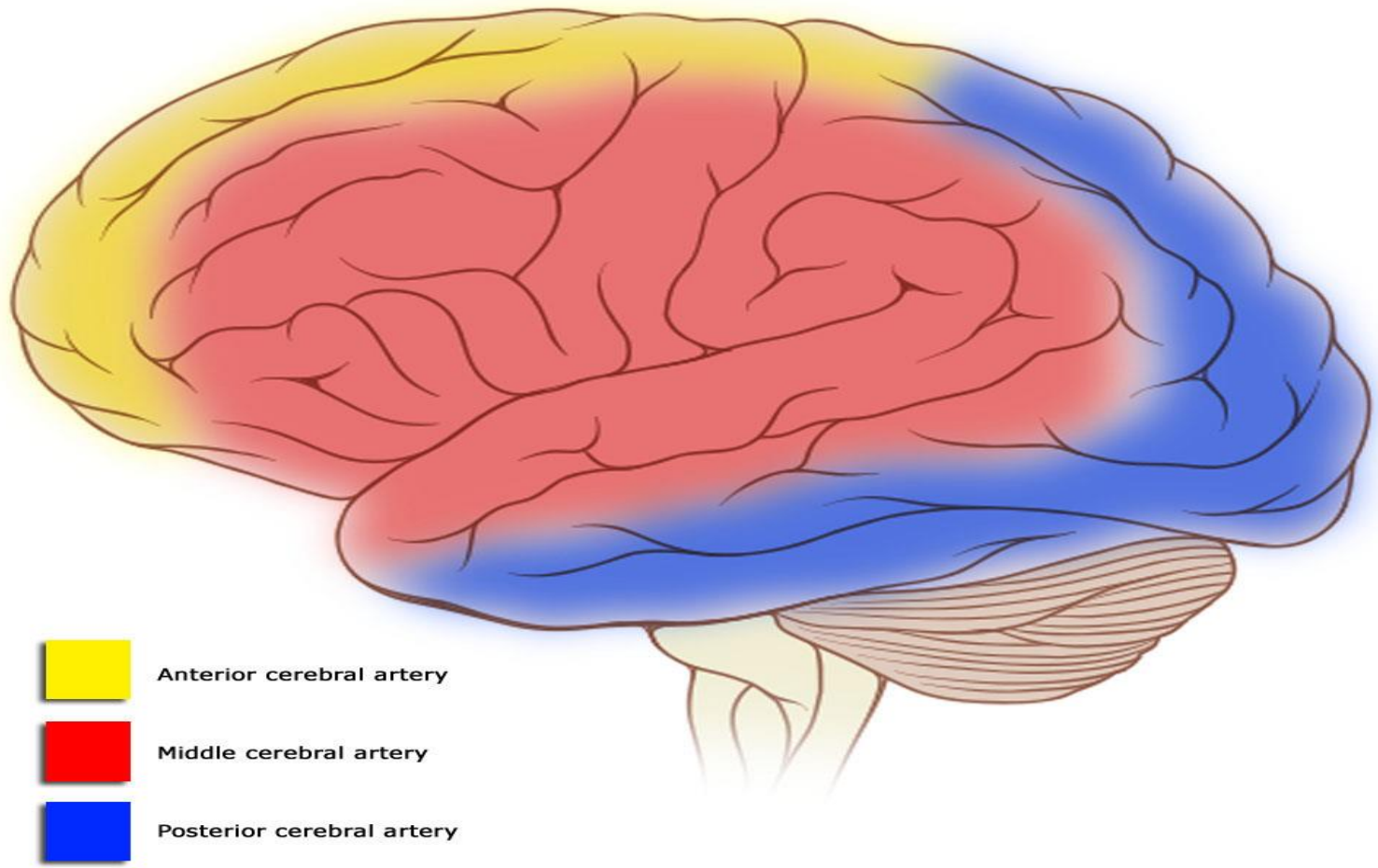
- It ramify the medial surface of the frontal and parietal lobes and supplies them. Also, its branches extend out of the great longitudinal fissure to supply a narrow lateral band of frontal and parietal cortices i.e. 2-2.5 cm laterally.

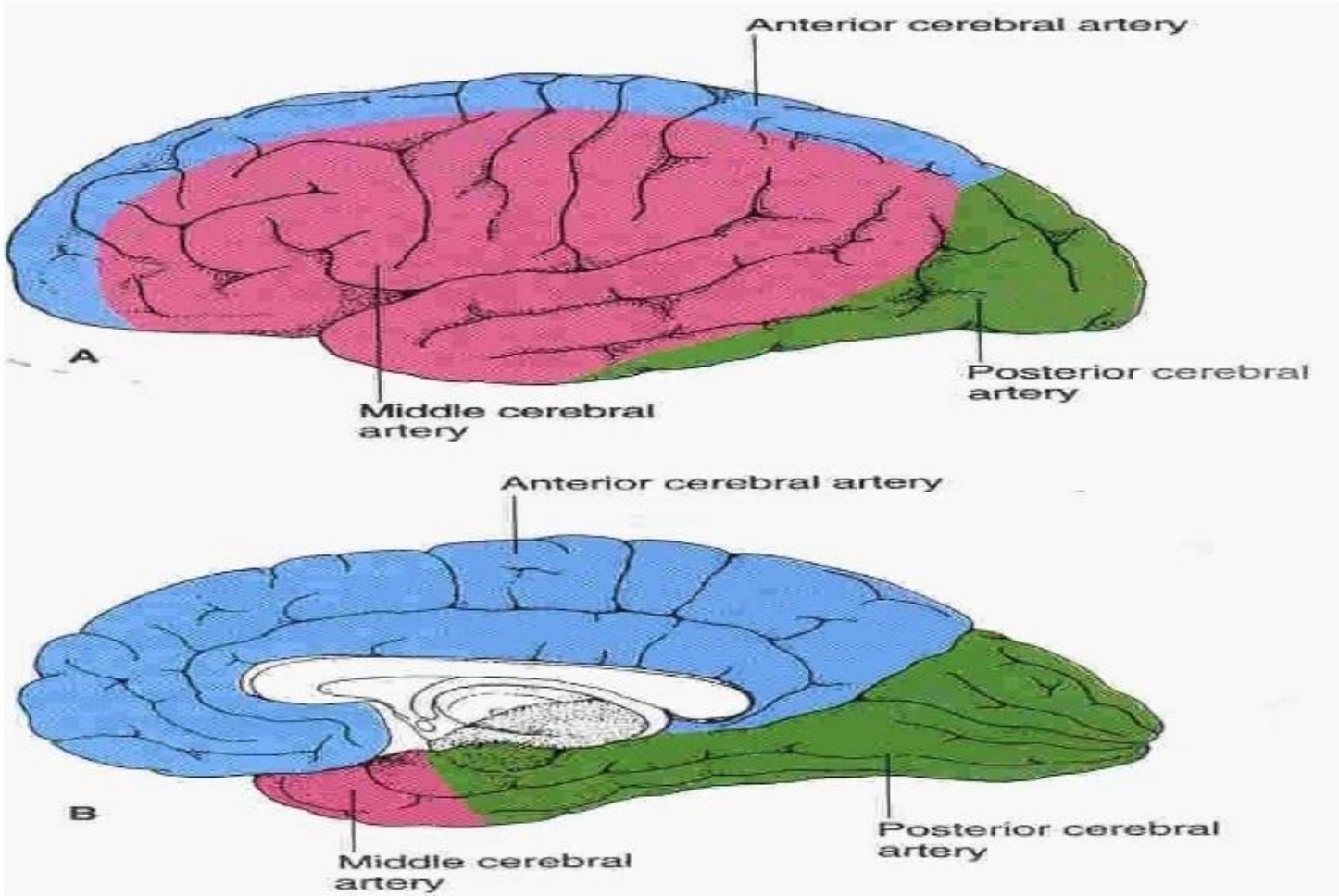
- The territory supplied by it includes the motor and sensory cortices for the lower limb.

- **Middle cerebral artery:**
- It is the largest branch of the 3 cerebral arteries. It passes laterally to enter the lateral fissure within which it subdivides.
- Its branches supply the whole of the lateral surface of the frontal, parietal and temporal lobes except those areas which are supplied by the ACA.
- It supplies the primary motor and sensory cortices for the whole body excluding the lower limb. The auditory cortex and the insula in the depth of the lateral fissure.
- It gives rise to a branch called ***lenticulostriate arteries*** which supply diencephalon & telencephalon.


Opthalmic Artery
Anterior Cerebral Artery
Middle Cerebral Artery
Posterior Communicating Artery
(posterior cerebral artery not shown)
Cavernous Sinus
Internal Carotid Artery

Cortical vascular territories



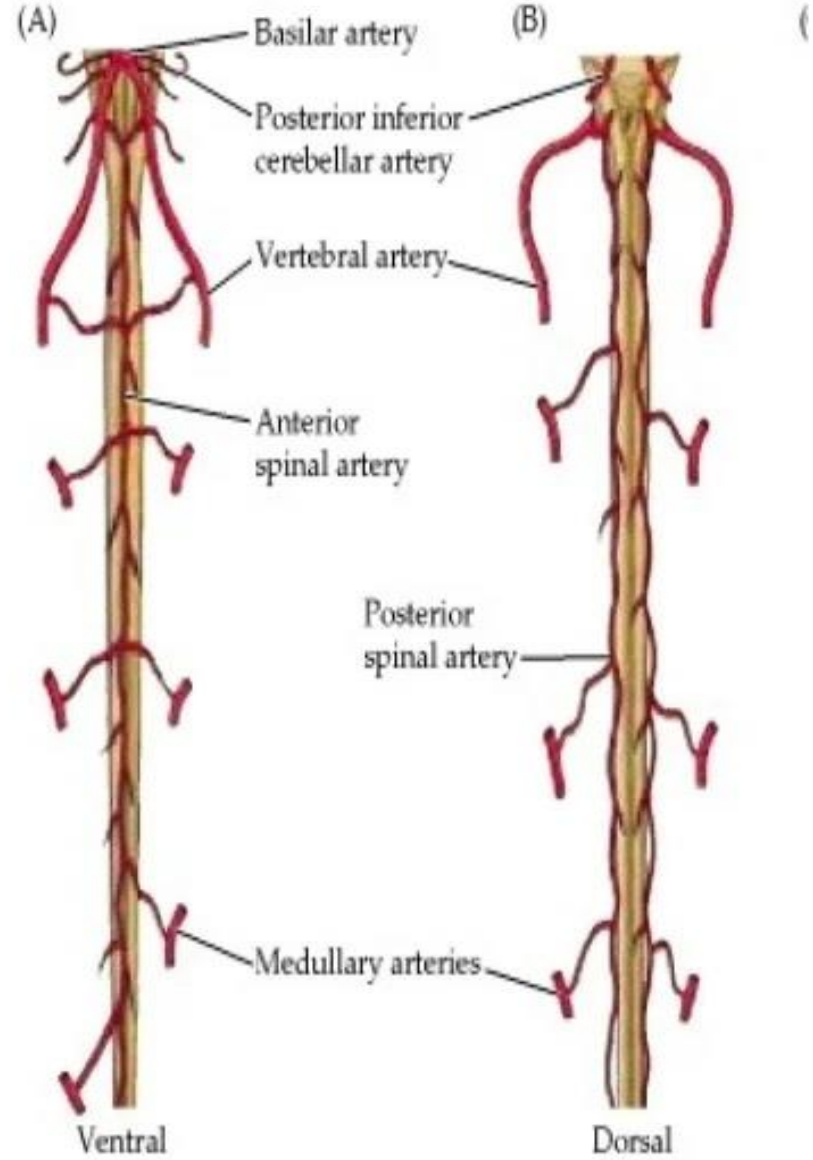

Anterior cerebral artery
A
Middle cerebral artery
Posterior cerebral artery
Anterior cerebral artery
B
Middle cerebral artery
Posterior cerebral artery

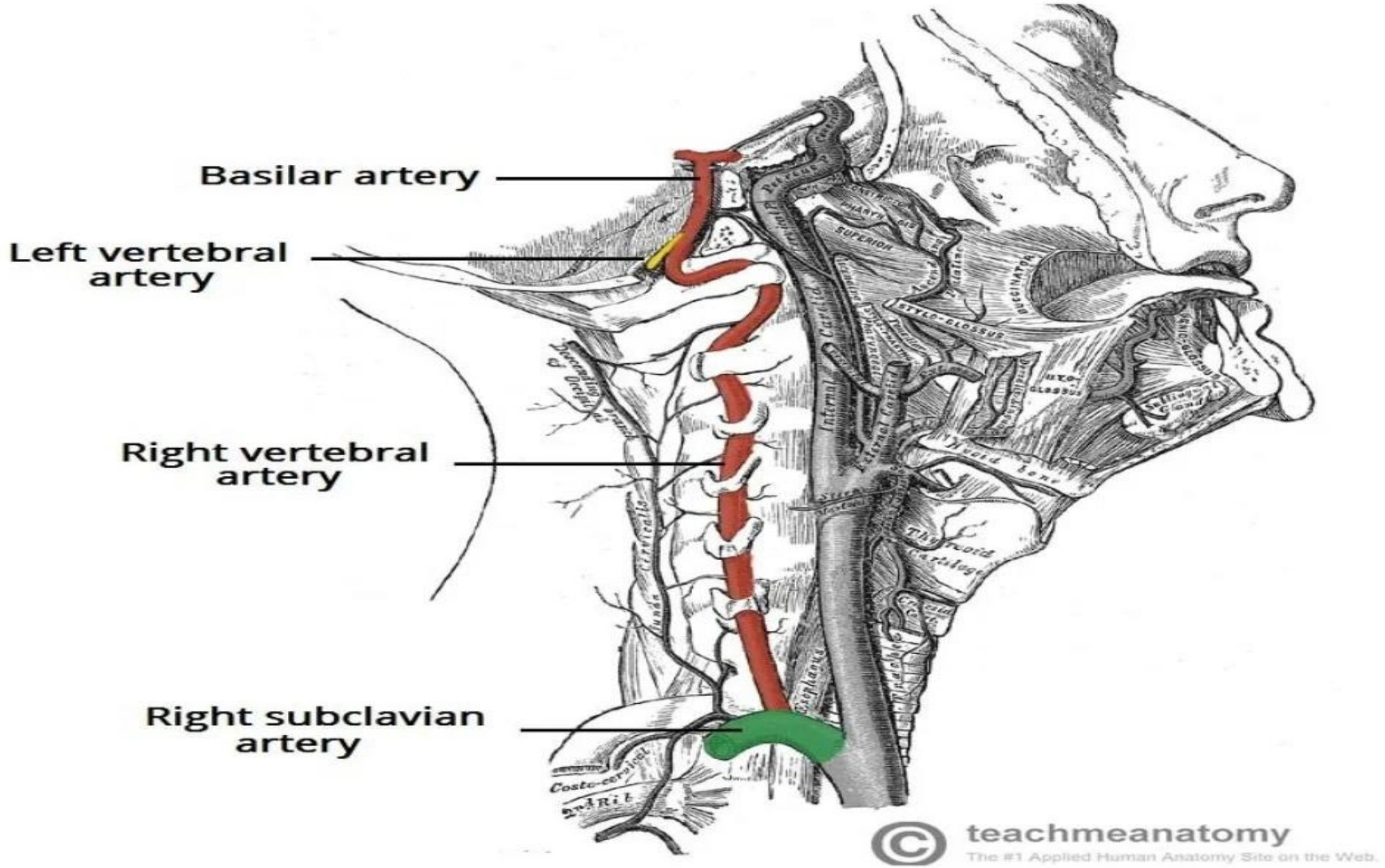
Vertebrobasilar system:

Verterbral Arteries:

- The **vertebral arteries** arise from the subclavian arteries and the ten **medullary arteries** that arise from segmental branches of the aorta provide the *primary vascularization of the spinal cord.*

- These medullary arteries join to form anterior and posterior spinal arteries.
- Loss of the posterior supply generally leads to loss of sensory functions, whereas loss of the anterior supply more often causes motor deficits.




Basilar artery
Left vertebral artery
Right vertebral artery
Right subclavian artery
teachmeanatomy
The #1 Applied Human Anatomy Site on the Web.

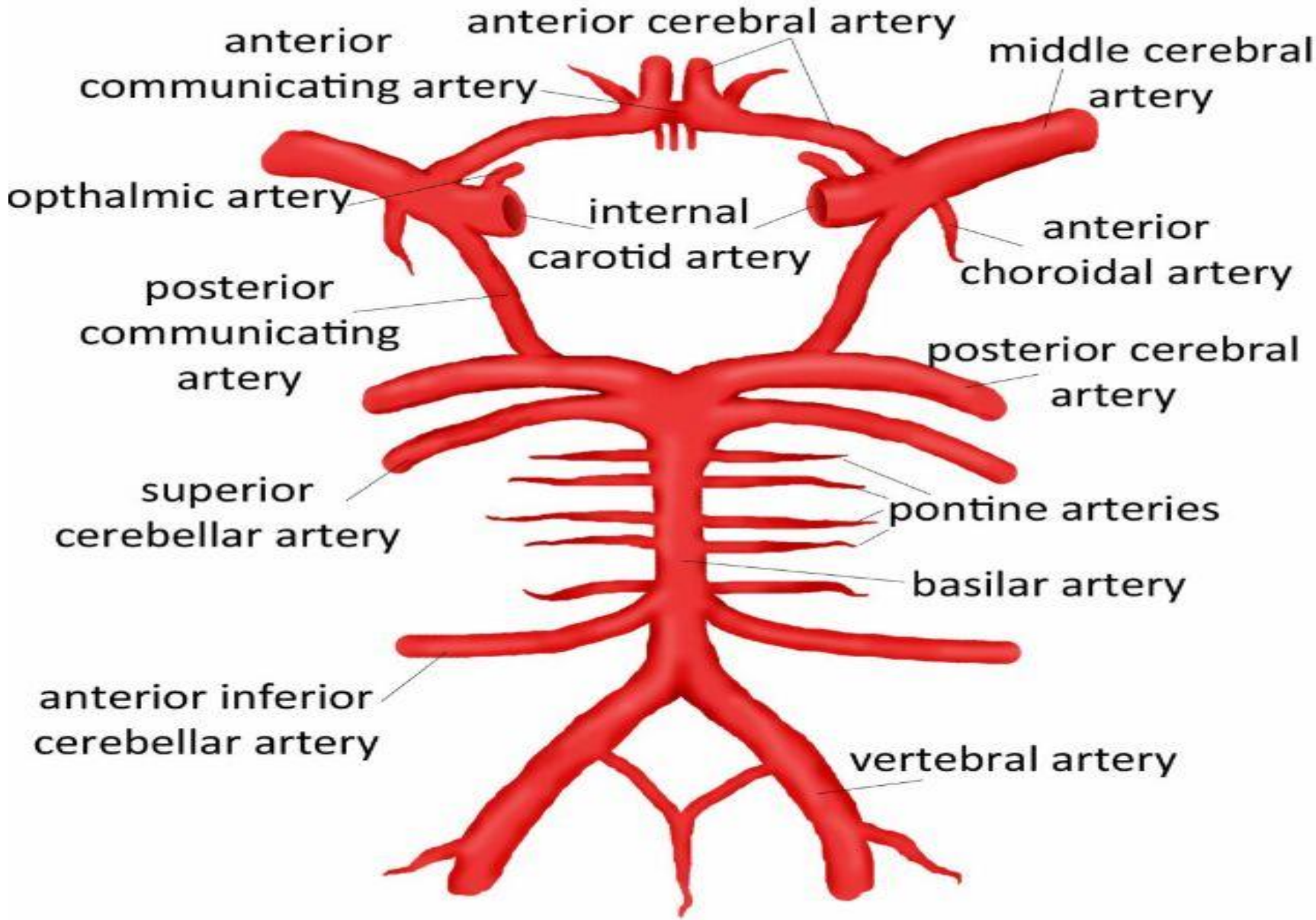
- **Basilar artery:**
- Anterior & posterior vertebral arteries unite at the junction between medulla and pons to form the basilar artery.

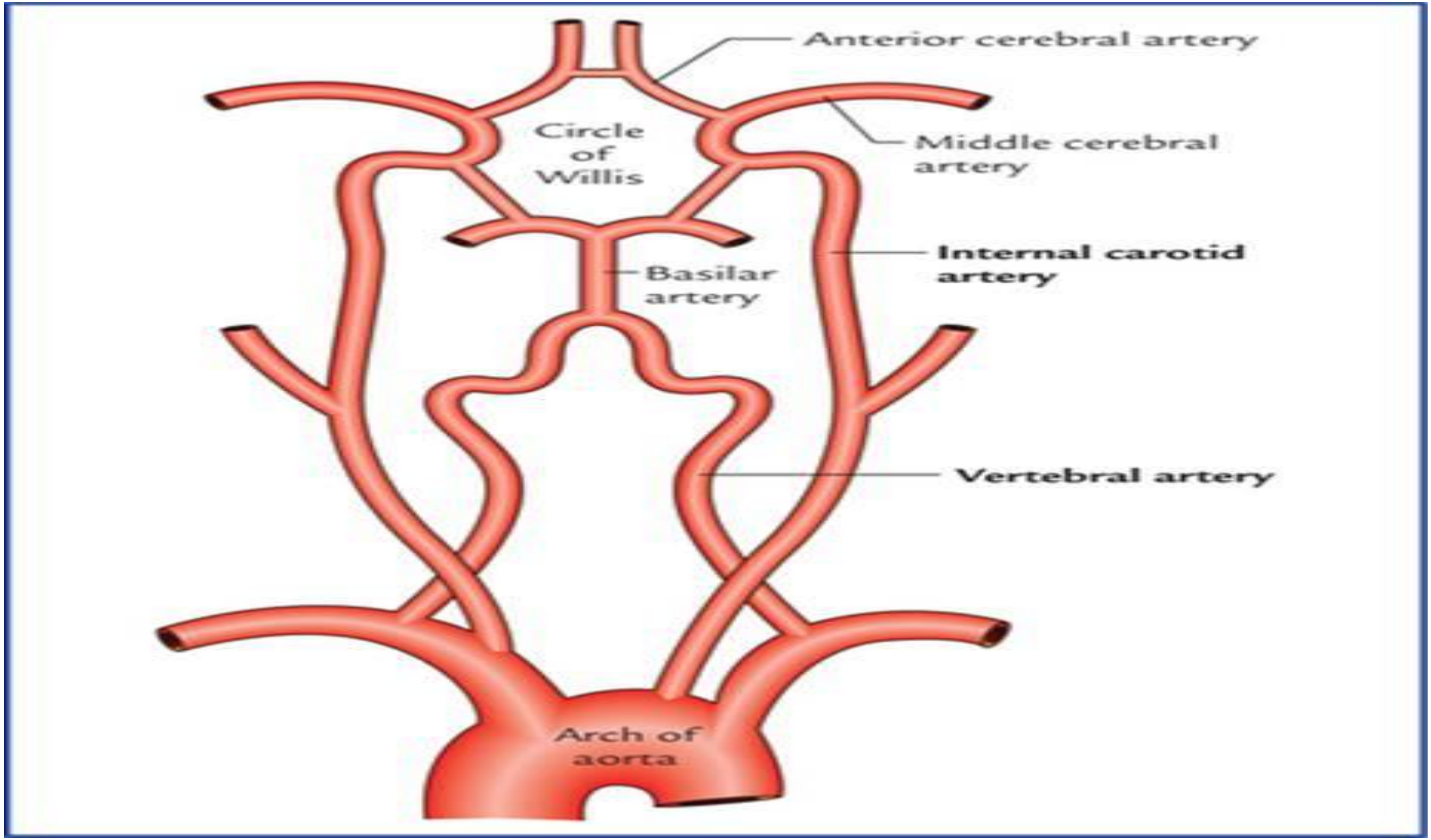
It gives rise to the following branches;

- 1- Anterior inferior cerebellar artery.
- 2- superior cerebellar artery
- 3- pontine arteries
- 4- labyrinthine arteries
- 5- posterior cerebral artery

Imp. The brain stem, cerebellum and occipital lobe are supplied by the vertebrobasilar system

- These arteries enter the cranial cavity through the foramen magnum.
- Each of it gives rise to the 3 main branches ;
- 1) the posterior spinal artery
- 2) anterior spinal artery
- 3) posterior inferior cerebral artery (supplied post. & infero aspect of cerebellum).


anterior cerebral artery
anterior communicating artery
middle cerebral artery
opthalmic artery
internal carotid artery
anterior choroidal artery
posterior communicating artery
posterior cerebral artery
superior cerebellar artery
pontine arteries
basilar artery
anterior inferior cerebellar artery
vertebral artery


Anterior cerebral artery
Circle of Willis
Middle cerebral artery
Internal carotid artery
Basilar artery
Vertebral artery
Arch of aorta

Branches of Basilar Artery:

1.Pontine arteries: It supplies pons.

2.Anterior inferior cerebellar artery:

It supplies the anterior and inferior portion of the cerebellum.

3. Labyrinthine artery

It supplies the inner ear. Its occlusion leads to vertigo & ipsilateral deafness.

4. Superior cerebellar artery

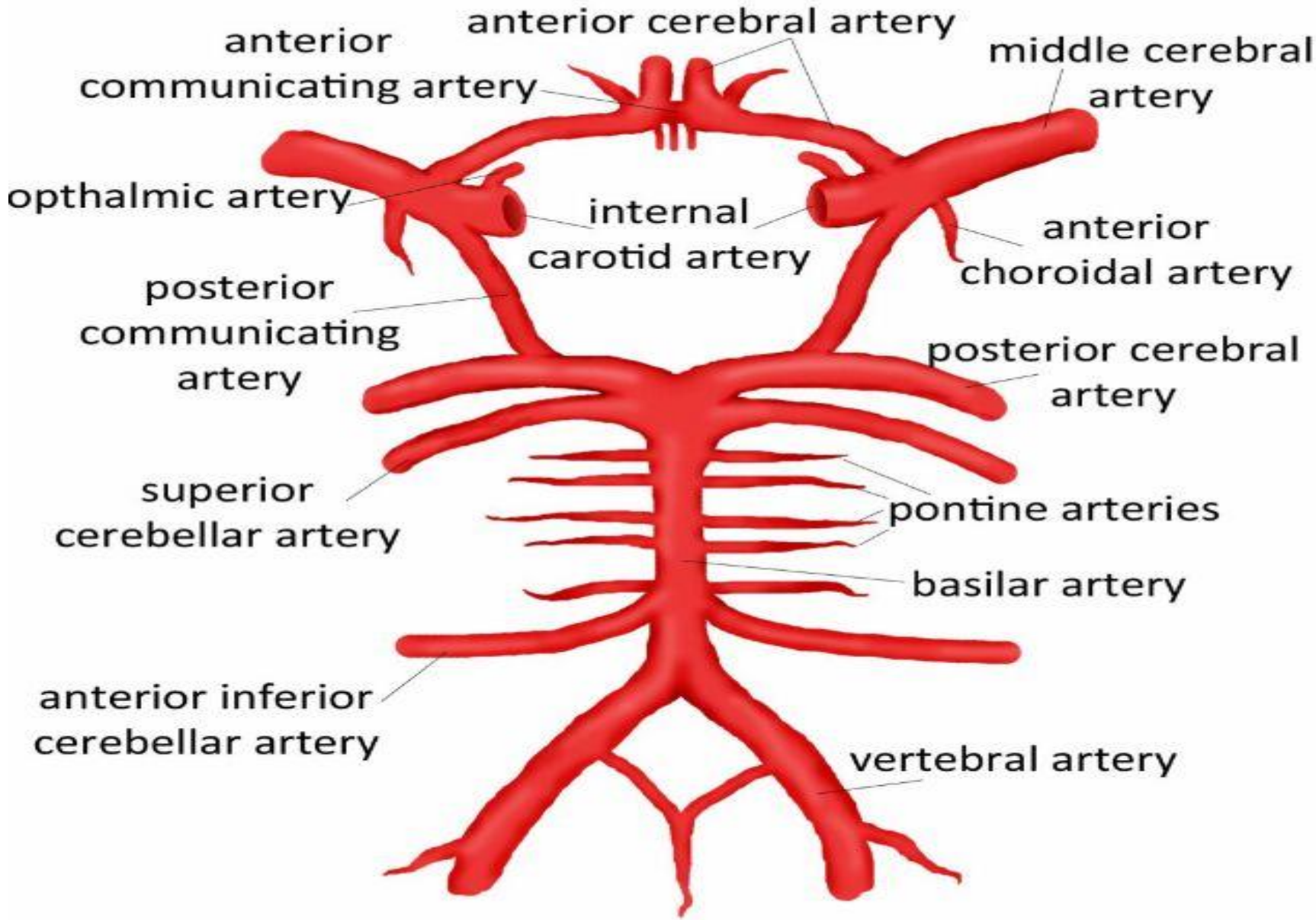
It supplies the superior aspect of the cerebellum.

5. Posterior cerebral artery:

It curves around the midbrain to supply the visual cortex of the occipital lobe and the infer-o-medial aspect of the temporal lobe.

Circle of Willis

- It is an arterial circle at the base of the brain in the interpeduncular fossa.
- It is formed by anterior and middle cerebral branches of the internal carotid artery & posterior cerebral branches of basilar artery.
- The two anterior cerebral arteries are connected by anterior communicating artery.
- The internal carotid artery and post cerebral artery of same side are united by posterior communicating artery.


anterior cerebral artery
anterior communicating artery
middle cerebral artery
opthalmic artery
internal carotid artery
anterior choroidal artery
posterior communicating artery
posterior cerebral artery
superior cerebellar artery
pontine arteries
basilar artery
anterior inferior cerebellar artery
vertebral artery

Venous Drainage of the Brain

It includes a External and Internal cerebral veins

- **External cerebral veins:**

1- *Superior cerebral veins* that drain superolateral surface of cerebral hemisphere terminate into superior sagittal veins.

2- *Superficial middle cerebral vein* drains area around lateral sulcus they terminate into cavernous sinus.

- **Internal cerebral vein**

1- Great cerebral veins : It is formed by union of two internal cerebral veins. It terminates in the straight sinus drains the deep

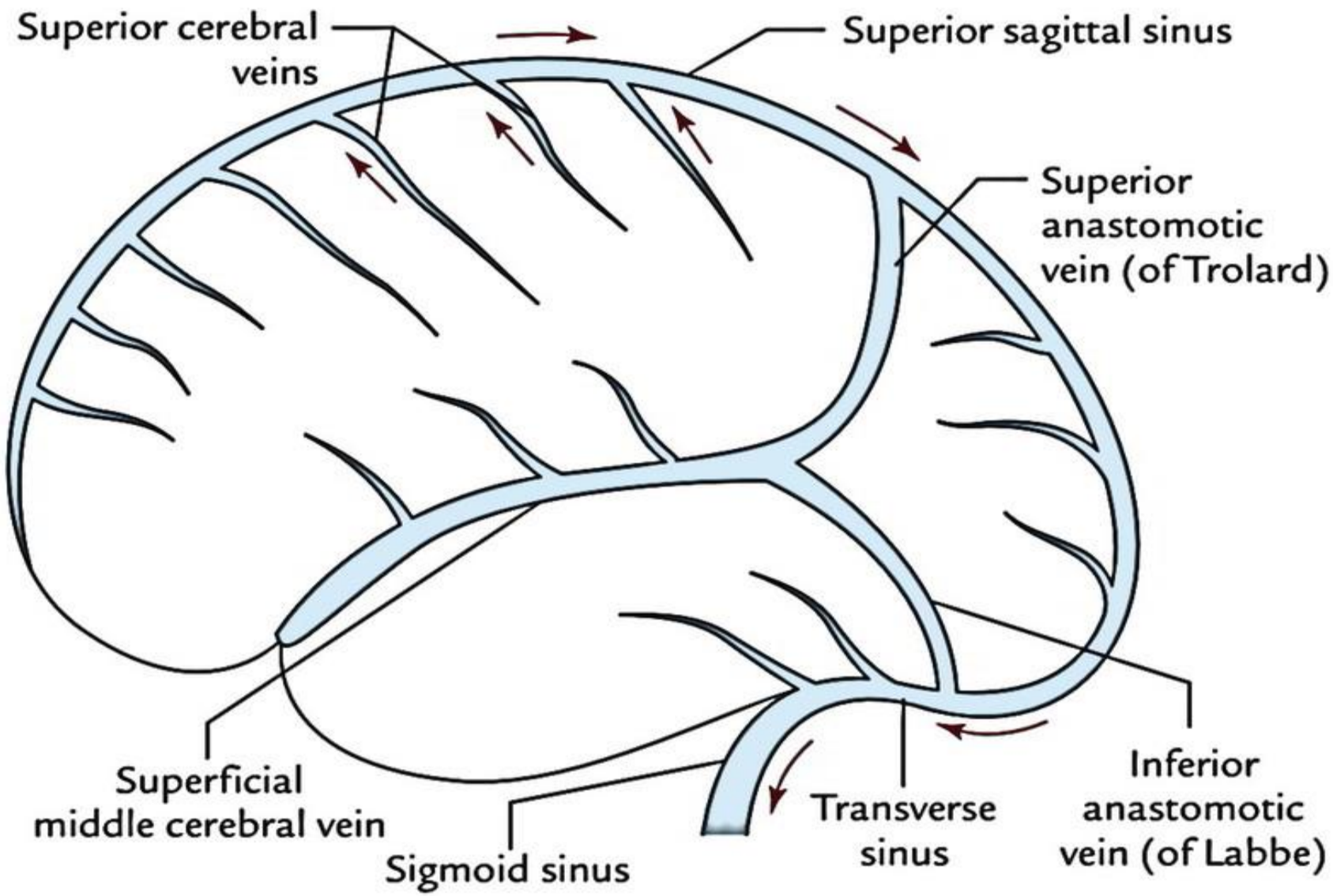
structures of the forebrain.

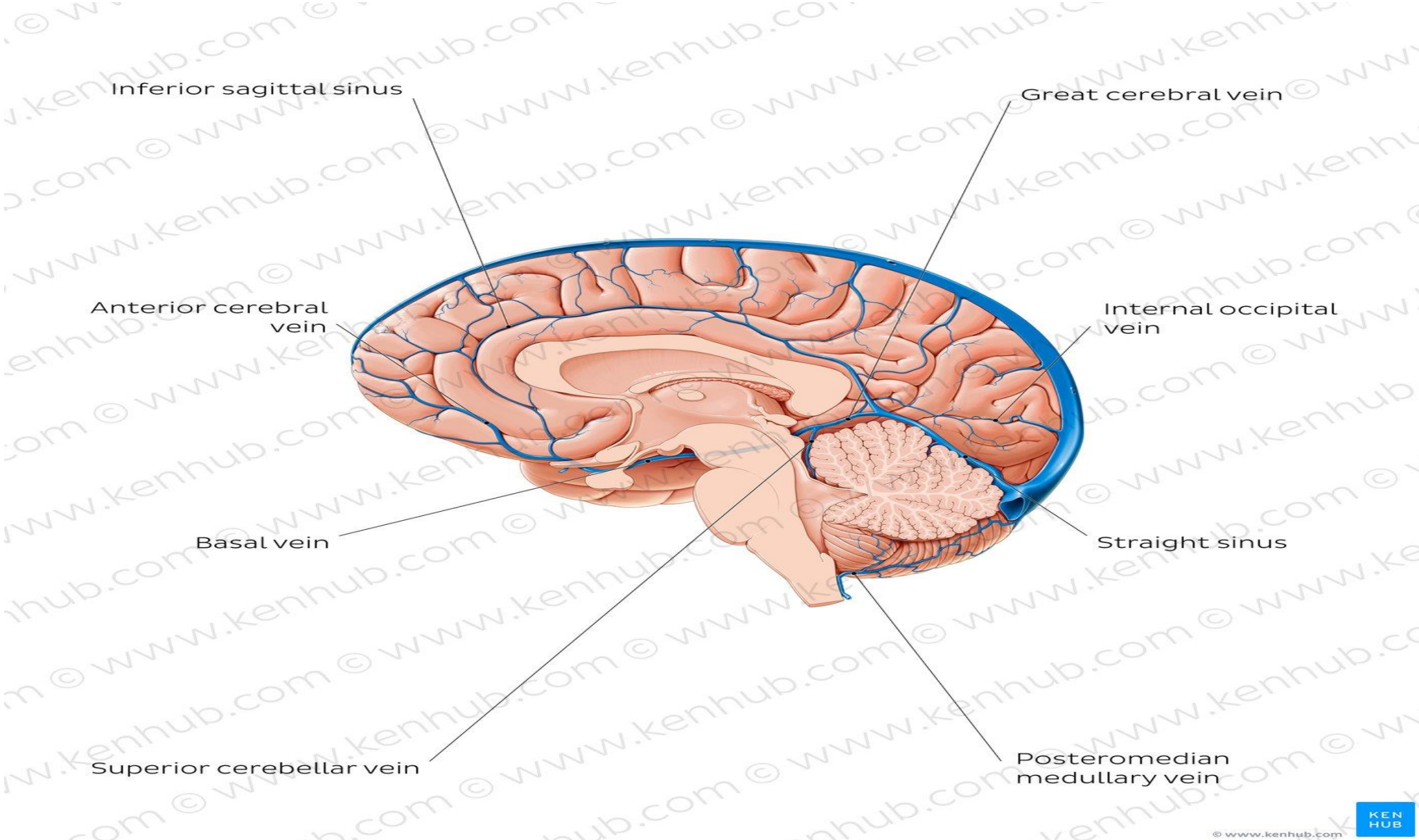
2- Basal veins : It is formed by union of deep middle cerebral vein and anterior cerebral vein and terminates by joining great cerebral vein.

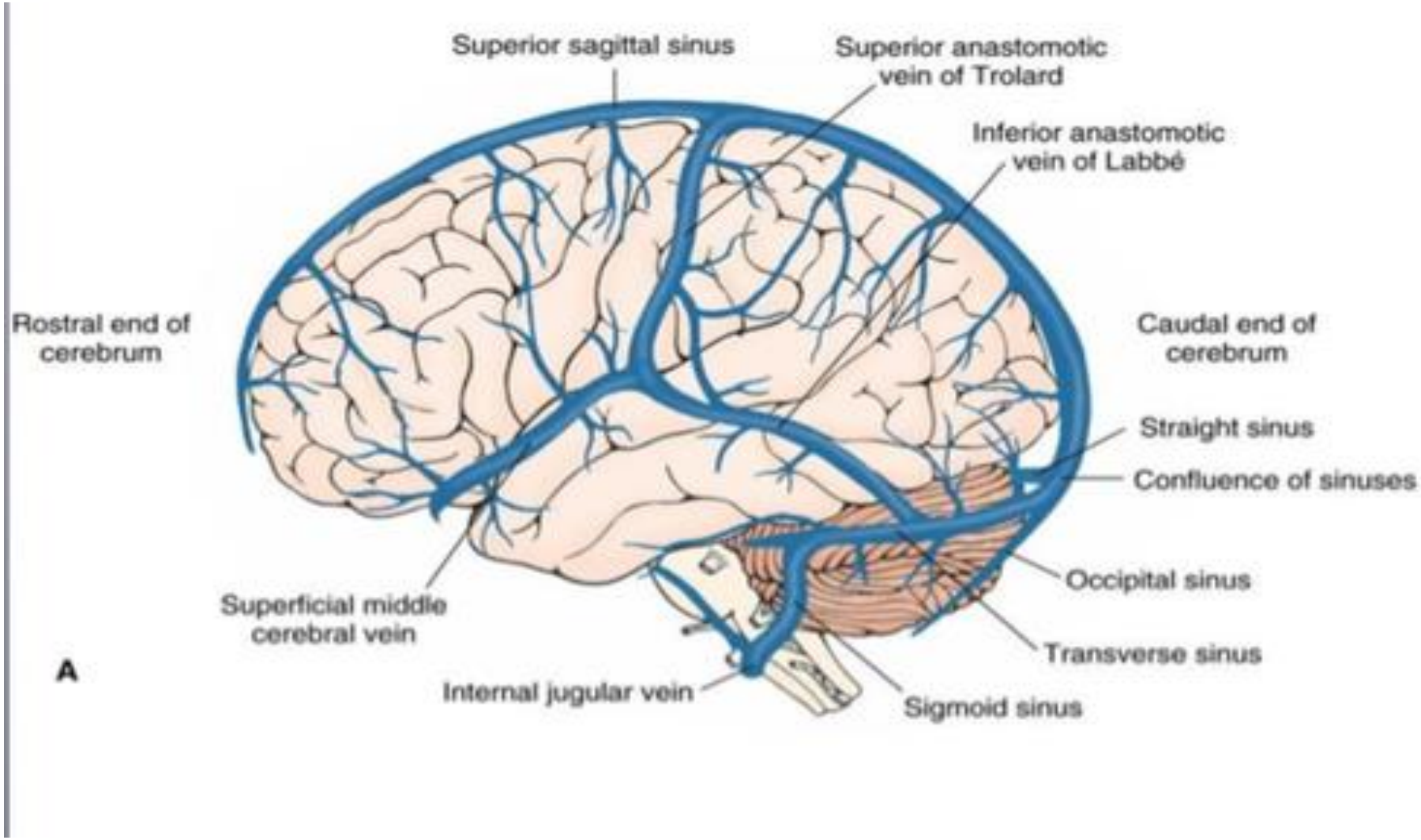
Key facts about the veins of the brainTable quiz	
Superficial veins of the cerebrum	Superficial cerebral veins Inferior cerebral veins Superficial middle cerebral vein
Deep veins of the cerebrum	Internal cerebral veins Great cerebral vein (of Galen) Basal veins
Veins of the cerebellum	Superior cerebellar veins Inferior cerebellar veins
Dural venous sinuses	Superior sagittal sinus Inferior sagittal sinus Straight sinus Transverse sinus Sigmoid sinus Cavernous sinus Sphenoparietal sinus Petrosal sinus Occipital sinus.

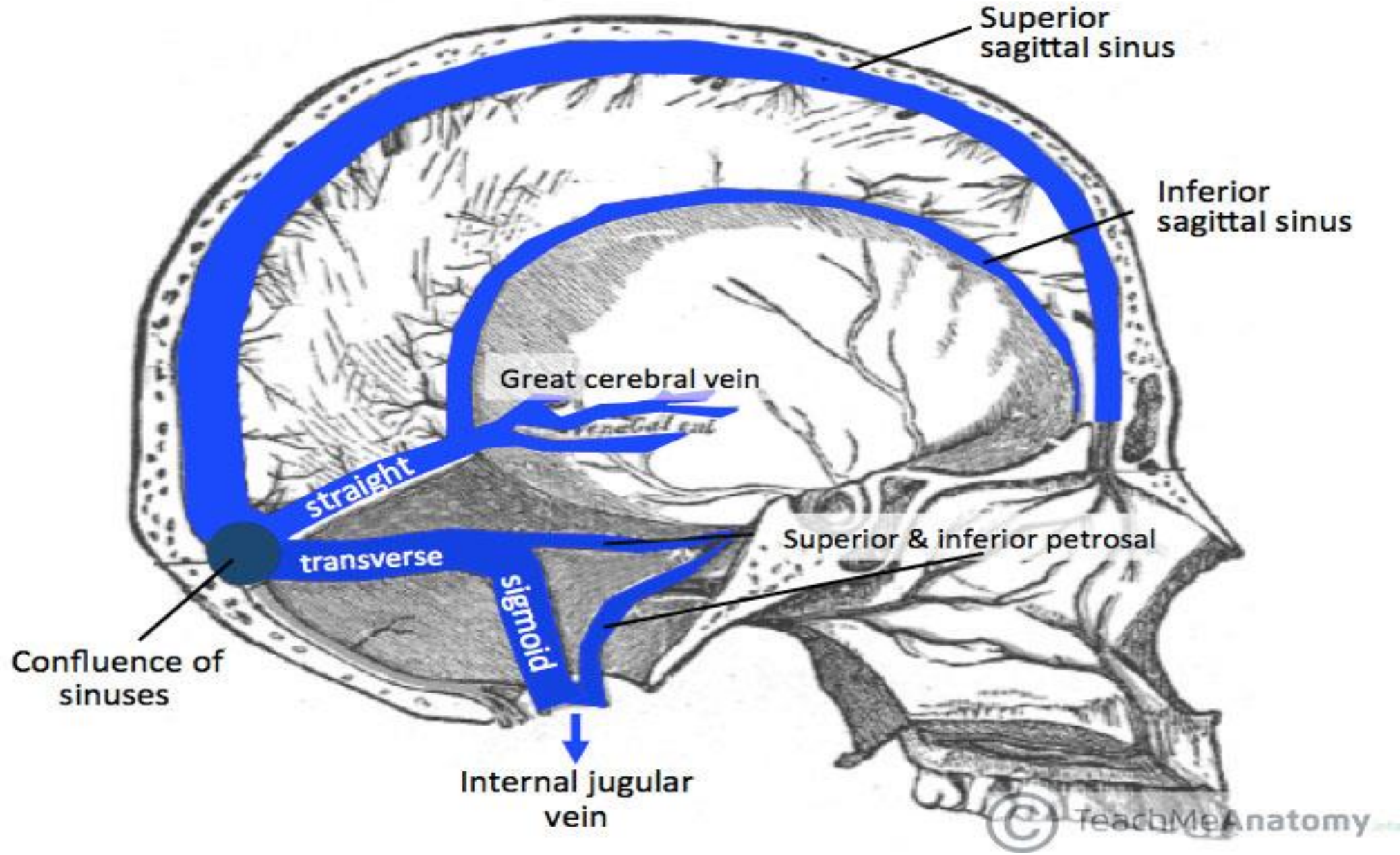
VEINS OF BRAIN

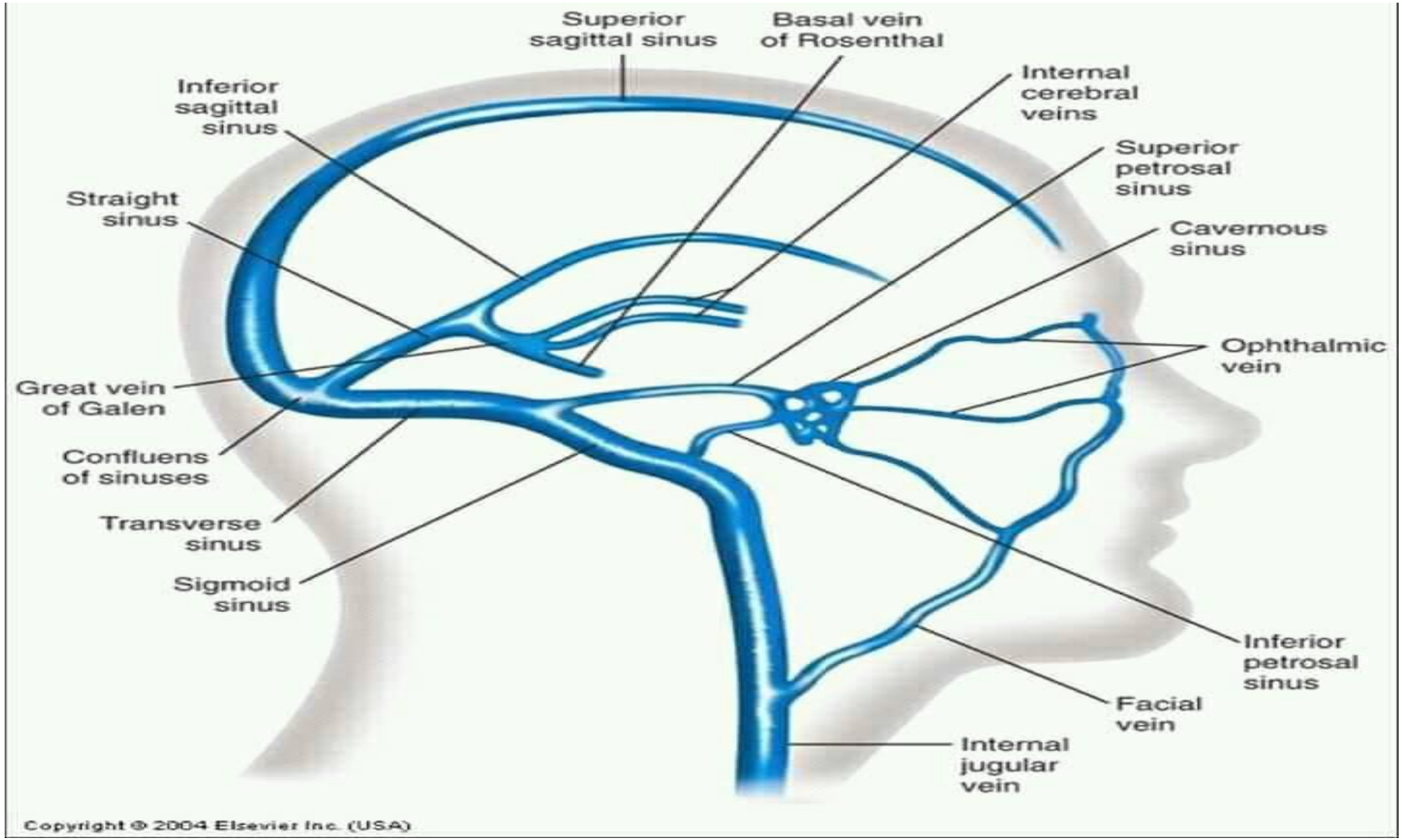
- Major veins of the brain include the superior and inferior cerebral veins, superficial middle cerebral veins, the great cerebral vein (of Galen), internal cerebral veins, as well as the superior and inferior cerebellar veins. They drain into the dural venous sinuses which are the:
- Superior sagittal sinus
- Inferior sagittal sinus
- Straight sinus
- Transverse sinus
- Sigmoid sinus
- Cavernous sinus
- Sphenoparietal sinus
- Superior and inferior petrosal sinuses
- Occipital sinus.

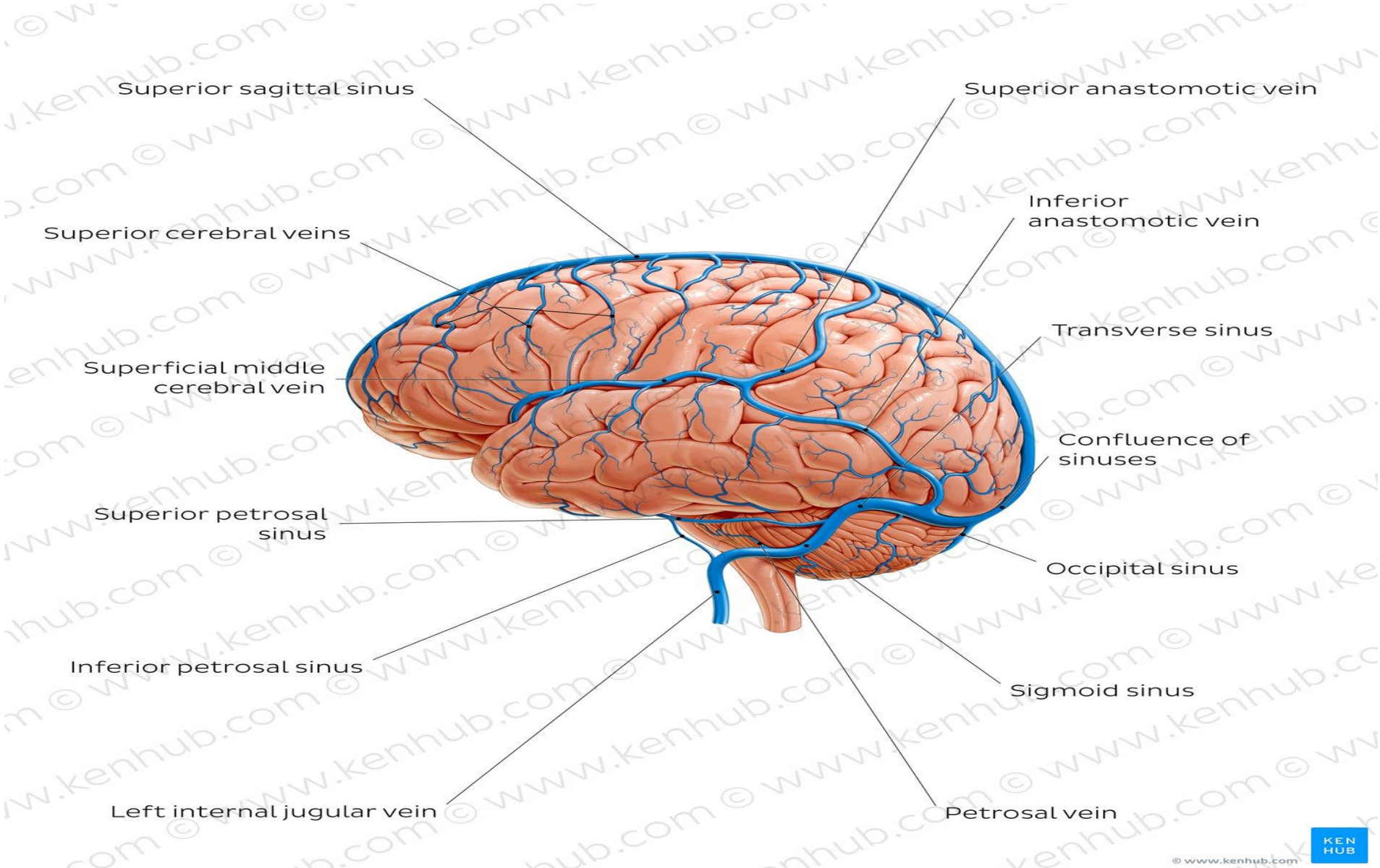

Superior cerebral veins
Superior sagittal sinus
Superior anastomotic vein (of Trolard)
Superficial middle cerebral vein
Sigmoid sinus
Transverse sinus
Inferior anastomotic vein (of Labbe)

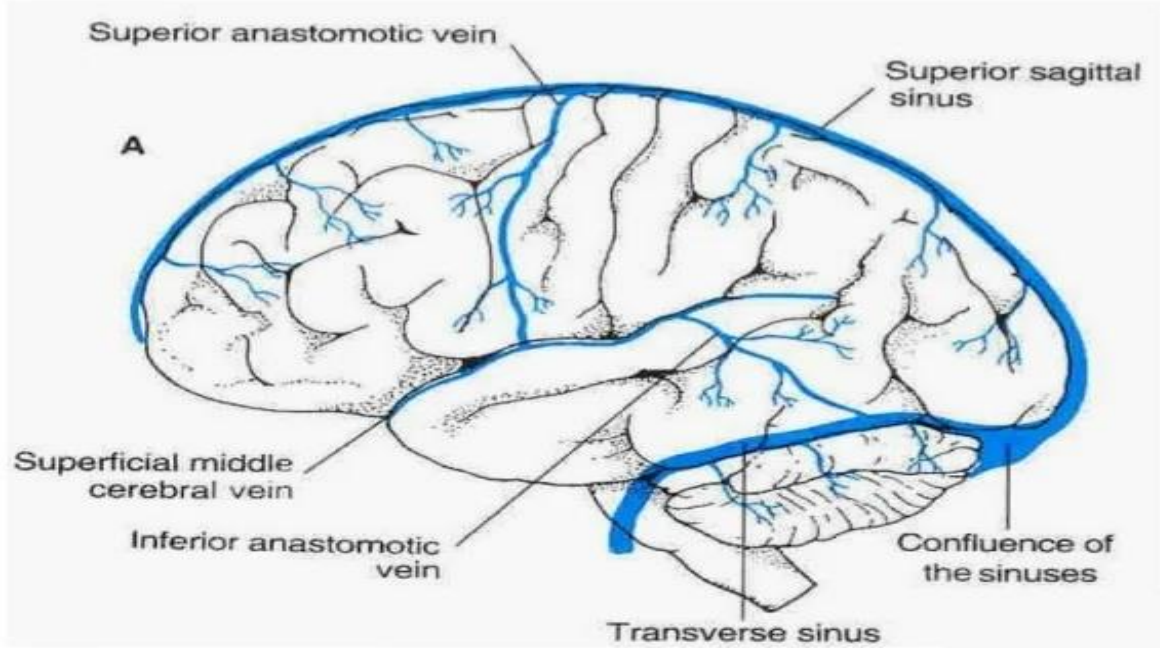

Inferior sagittal sinus
Great cerebral vein
Anterior cerebral vein
Internal occipital vein
Basal vein
Straight sinus
Superior cerebellar vein
Posteromedian medullary vein
© www.kenhub.com
KEN HUB

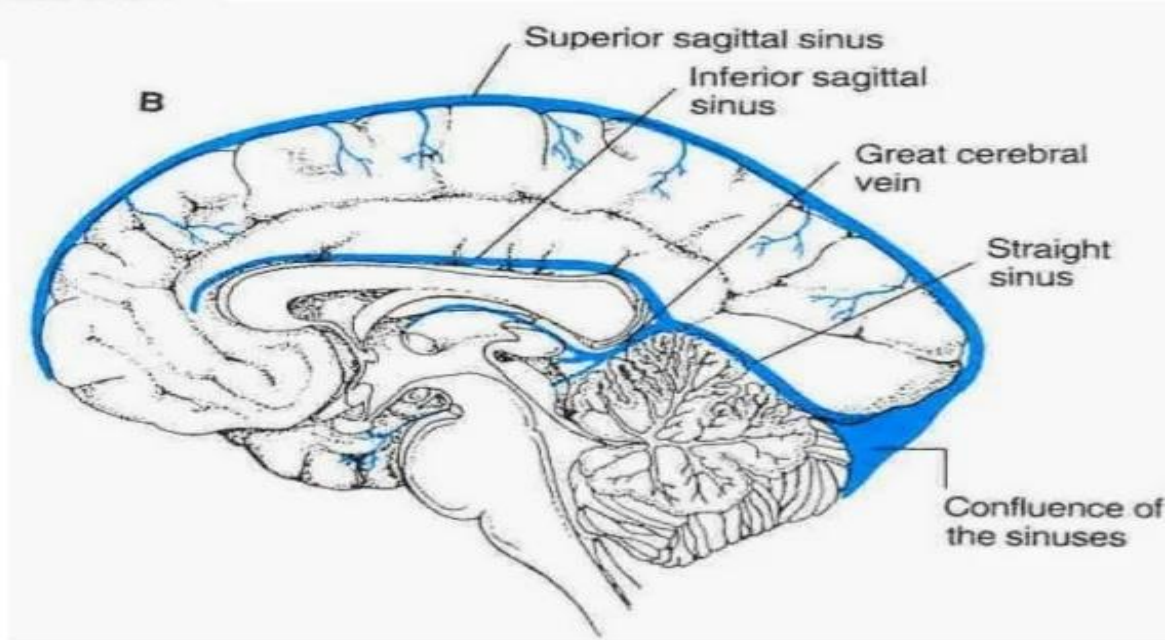

Superior sagittal sinus
Superior anastomotic vein of Trolard
Inferior anastomotic vein of Labbé
Rostral end of cerebrum
Caudal end of cerebrum
Straight sinus
Confluence of sinuses
Occipital sinus
Transverse sinus
Sigmoid sinus
Internal jugular vein
Superficial middle cerebral vein
A


Superior sagittal sinus
Inferior sagittal sinus
Great cerebral vein
straight
transverse
sigmoid
Superior & inferior petrosal
Confluence of sinuses
Internal jugular vein
TeachMeAnatomy


Superior sagittal sinus
Basal vein of Rosenthal
Internal cerebral veins
Inferior sagittal sinus
Superior petrosal sinus
Straight sinus
Cavernous sinus
Ophthalmic vein
Great vein of Galen
Confluens of sinuses
Transverse sinus
Sigmoid sinus
Inferior petrosal sinus
Facial vein
Internal jugular vein
Copyright © 2004 Elsevier Inc. (USA)


Superior sagittal sinus
Superior anastomotic vein
Superior cerebral veins
Inferior anastomotic vein
Transverse sinus
Superficial middle cerebral vein
Confluence of sinuses
Superior petrosal sinus
Occipital sinus
Inferior petrosal sinus
Sigmoid sinus
Left internal jugular vein
Petrosal vein
© www.kenhub.com
KEN HUB


Superior anastomotic vein
Superior sagittal sinus
A
Superficial middle cerebral vein
Inferior anastomotic vein
Confluence of the sinuses
Transverse sinus


Superior sagittal sinus
Inferior sagittal sinus
B
Great cerebral vein
Straight sinus
Confluence of the sinuses

The end