



BAU-Medicine



SHEET NO. 7

LECTURE DATE: 24.2.2021

LECTURE TITLE: Blood Supply of the CNS

WRITTEN BY: Homam Ababneh

EDITED BY: Ammar Sameeh Amro

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اللهم اغفر له و ارحمه و اعف عنه و اكرم منزله". "اللهم ابدله داراً خيراً
من داره و أهلاً خيراً من اهله". "اللهم انقله من ضيق اللحد و من مراتع
الدود الى جناتك جنات الخلود". "لا إله إلا أنت يا حنان يا منان يا بديع
السموات والأرض تغمد (رشيد) برحمتك يا أرحم الراحمين

Lecture Objectives

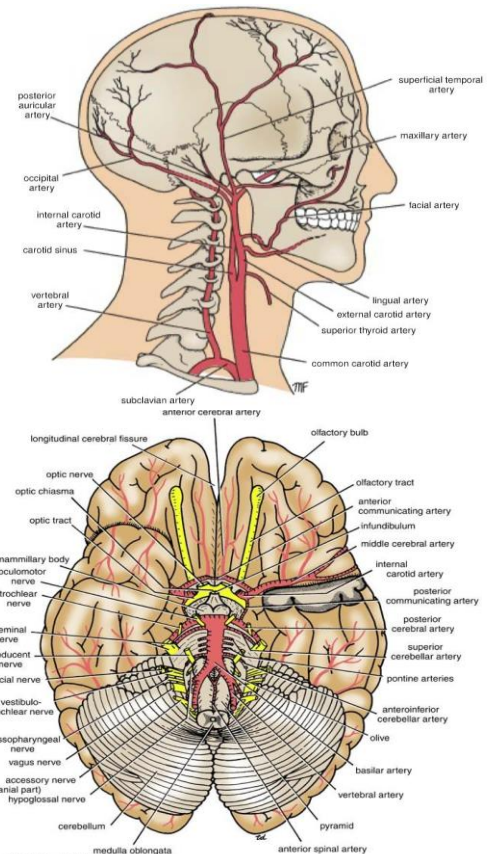
- Describe the four arteries supplying the CNS.
- Follow up each artery to its destination.
- Describe the circle of Willis and its branches.
- Discuss the principle of end artery type of circulation.
- Describe venous drainage of the brain.

Any problem in blood supply (stroke, rupture, aneurysm..etc) for certain area will damage this area leading to dysfunction. So, you should be able to connect symptoms with artery supplying damaged area.

- There are 4 major arteries that supply the brain
 1. Left and Right vertebral arteries
 2. Left and Right internal carotid artery.
- Internal carotid arteries enter the cranial cavity through **Carotid canal**.
- Vertebral arteries enter the cranial cavity through **Foramen magnum**.

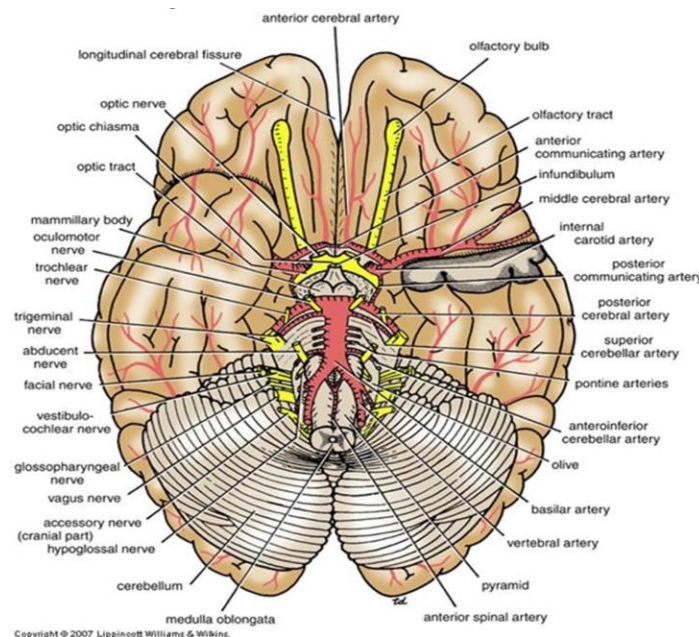
Vertebral Artery

- Branch of the 1st part of the subclavian a.
 - Ascends the neck through the upper six transverse vertebrae
 - Enters the skull through foramen magnum
- Both sides unite to form the **basilar a.**
- (Ascends anterior to the pons. Pons has a broad anterior bulge & there is a sulcus like structure anteriorly called **Basilar sulcus**, where the basilar artery located.



Vertebral Artery branches

- **Meningeal aa.**
- **Anterior spinal artery** : 2 small branches from the vertebral arteries unite to form anterior spinal artery
- **Posterior spinal artery** : arises from the **vertebral artery** in 25% of humans and 75% from the posterior inferior cerebellar artery (PICA).
- **Posterior inferior cerebellar artery (PICA)**
- **Medullary artery** : supply the medulla oblongata



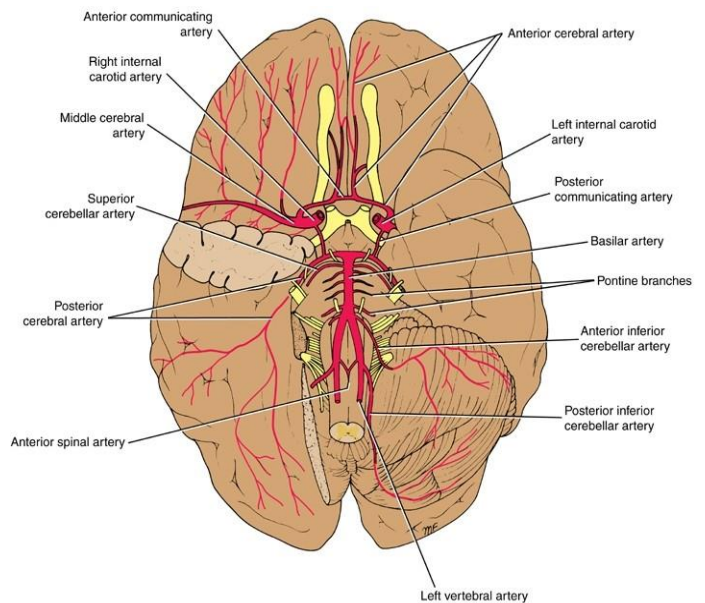
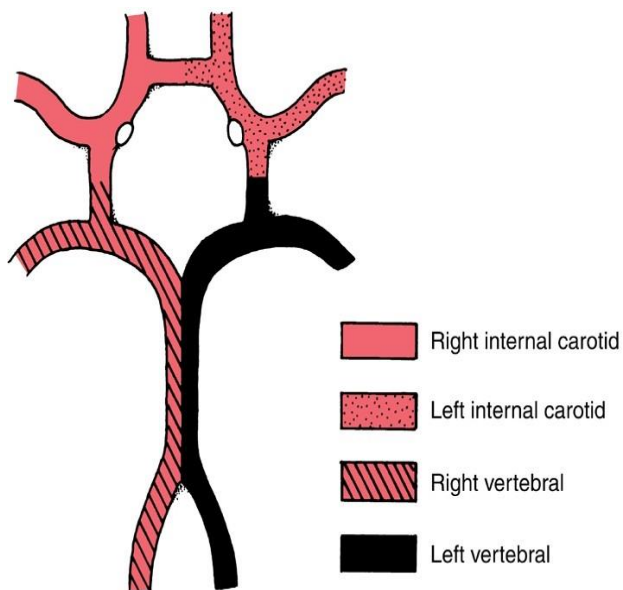
Basilar Artery

- Ascend in front of pons (extends from the beginning of pons till the end of it)
- Participate in forming circle of Willis
- Branches
 1. Anterior inferior cerebellar artery (AICA)
 2. Pontine artery
 3. Superior cerebellar artery
 4. Posterior cerebral artery (**end branches**)
 - Inferior & posterior parts of cerebrum

Note: There are 3 cerebellar arteries:

- 2 of them are **inferior** :
 - 1- Posterior inferior cerebellar a. (branch from vertebral a.)
 - 2- Anterior inferior cerebellar a. (branch from basilar a.)
- 1 is **superior**: superior cerebellar a. (branch from basilar a.)

Blood Supply to Cortex: Circle of Willis



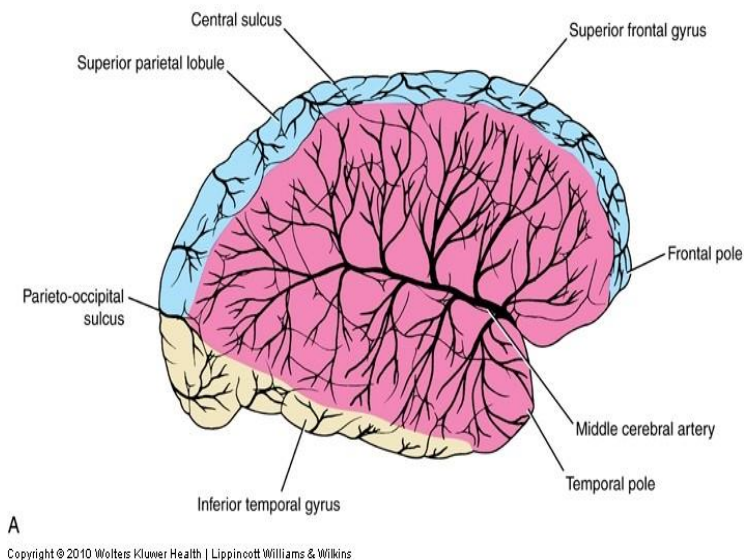
Basilar artery and posterior cerebral artery are main contributors to circle of Willis.

The circle of Willis (cerebral arterial circle or circulus arteriosus) is an anastomotic ring of arteries located at the base of the brain. This arterial anastomotic circle connects the two major arterial systems to the brain, the internal carotid arteries and the vertebrobasilar (vertebral and basilar arteries) systems. (from kenhub just to understand)

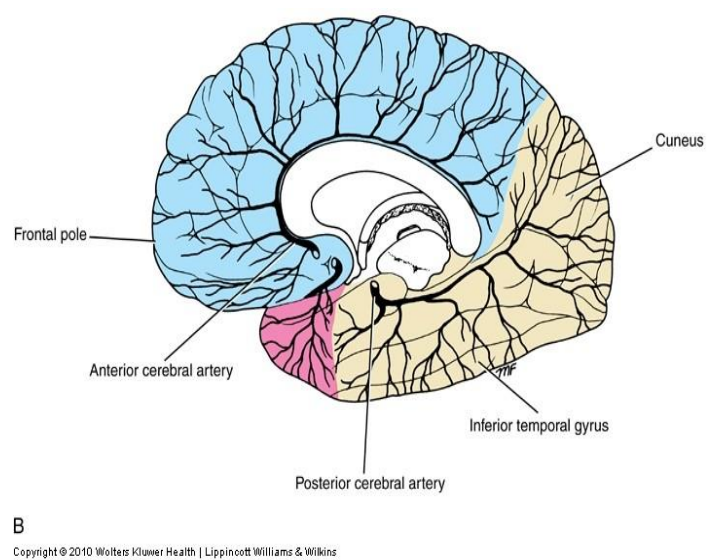
- Basilar artery give **posterior cerebral artery**
- Internal carotid give three branches: **1-posterior communicating artery**, **2-middle cerebral** and **3-anterior cerebral** (2 anterior cerebral connected by anterior communicating).

Circle of Willis surrounds the stalk of infundibulum (inferior wall of hypothalamus) and the optic chiasm.

Blood Supply to Cortex: Vascular Territories



Lateral view

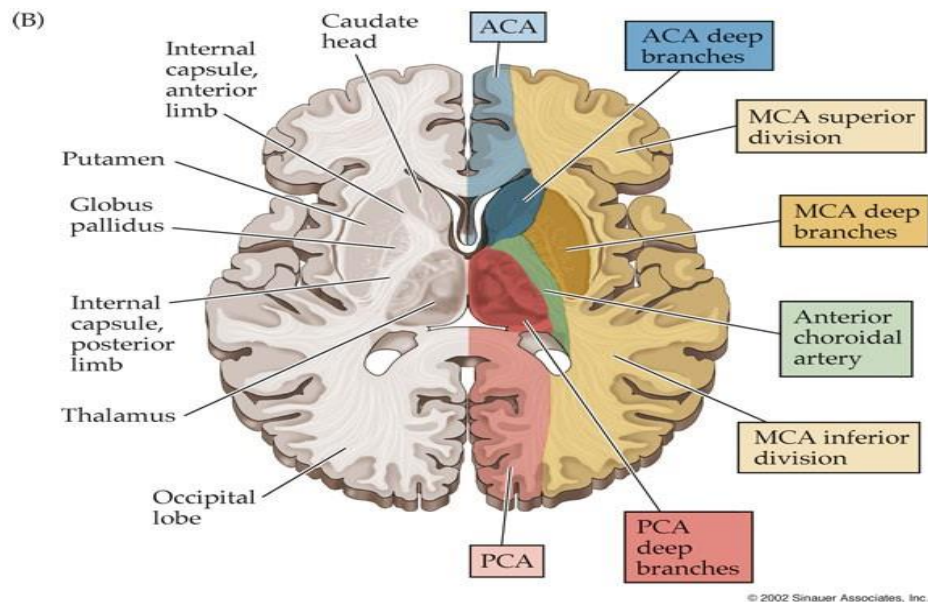


Medial view

3 colors each one indicates 3 major cerebral arteries:

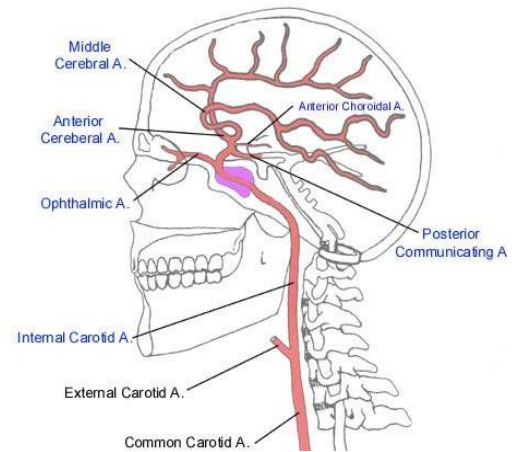
- 1- **Pink** area indicates for **Middle cerebral artery**: arises from the internal carotid and continues into the lateral sulcus of cerebral cortex.
 - Most of the lateral area supplied by middle carotid artery (frontal, temporal and parietal lobes) except the edges
- 2- **Blue** area indicates for **anterior cerebral artery**: arises from the internal carotid and continues above corpus callosum.
 - Supply medial side of frontal and parietal lobes and part of lateral side(edges)
- 3- **White** area indicates for **Posterior cerebral artery**: arises from basilar artery.
 - Supply medial side of temporal and occipital lobes

Blood Supply to Deep Structures



Internal Carotid Artery

- 1- **Ophthalmic artery**
- 2- **Posterior communicating artery**
(Connect posterior cerebral artery with the ICA)
- 3- **Anterior choroidal artery**
(Supplies internal portions)
- 4- **Anterior cerebral artery** (medially)
- 5- **Middle cerebral artery** (laterally)



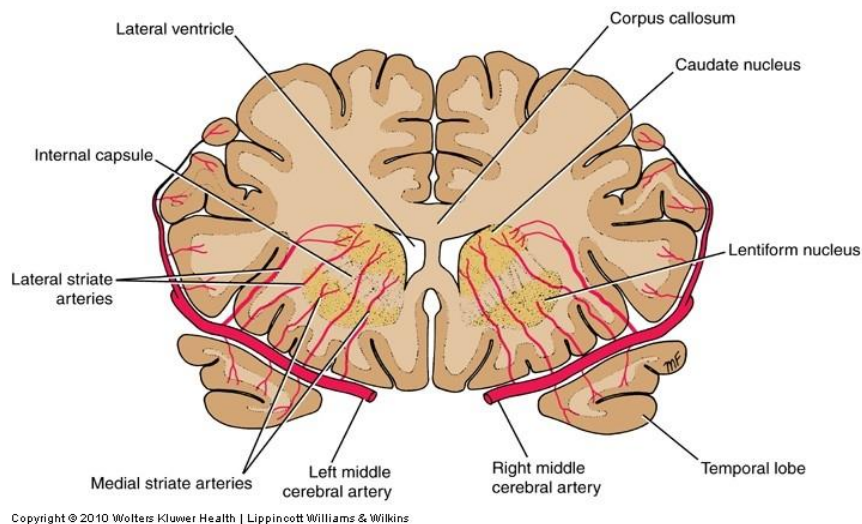
Middle Cerebral Artery

- Major branch of ICA, passes through the lateral fissure and it will reach the lateral surface
- Supply:
 - 1- Language areas (**left MCA** in most people; because these areas are in left side only rather than both sides) plus speech areas.
 - 2- Motor & somatosensory cortex (except- lower limb & perineum, which are supplied by anterior cerebral artery)
 - If there is a block in branches of middle cerebral artery that supply pre-motor area, paralysis may occur except for lower limb and perineum.

3- Auditory cortex

4- basal ganglia & internal capsule (genu) - Lenticulostriate arteries
(deep arteries)

If block happens in middle cerebral artery, the signs and symptoms will indicate the specific site of block.



Deep branches of middle cerebral artery (Lenticulostriate arteries)

Anterior Choroidal Artery

Supply:

- Hippocampus, uncus & amygdala
- Choroid plexus (temporal horn of lateral ventricle)
- Globus pallidus, putamen, part of thalamus
- Internal capsule (posterior limb) : most of corticospinal tract

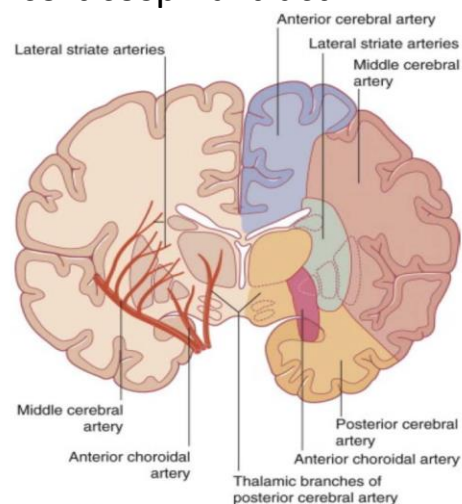
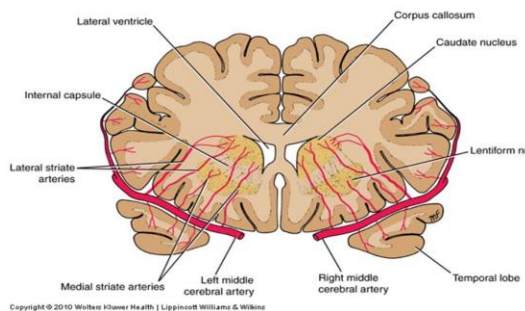
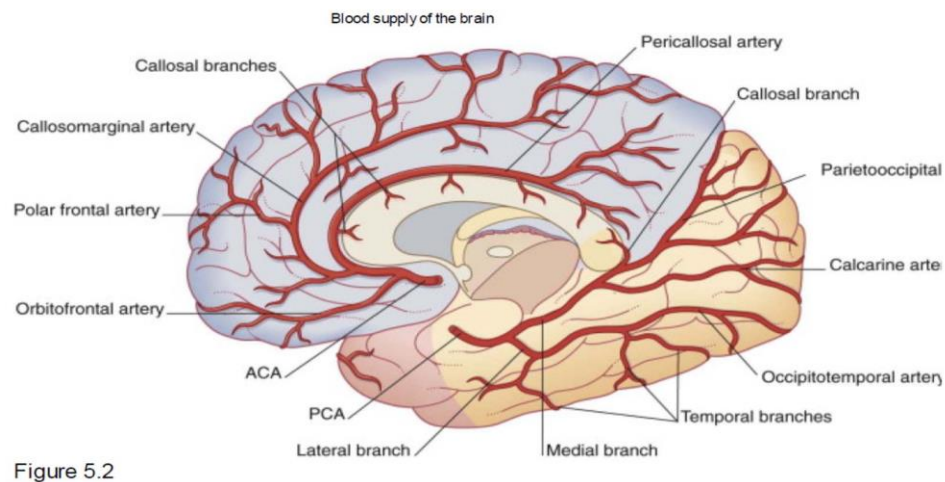
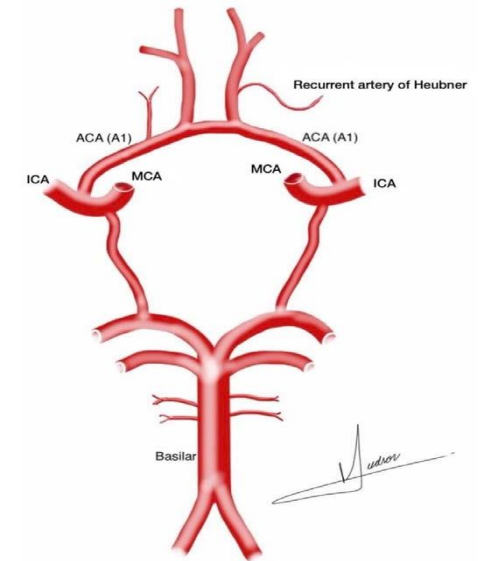


Figure 5.4

Anterior Cerebral Artery

It passes anteriorly (through the longitudinal fissure) above corpus callosum medially and supplies:

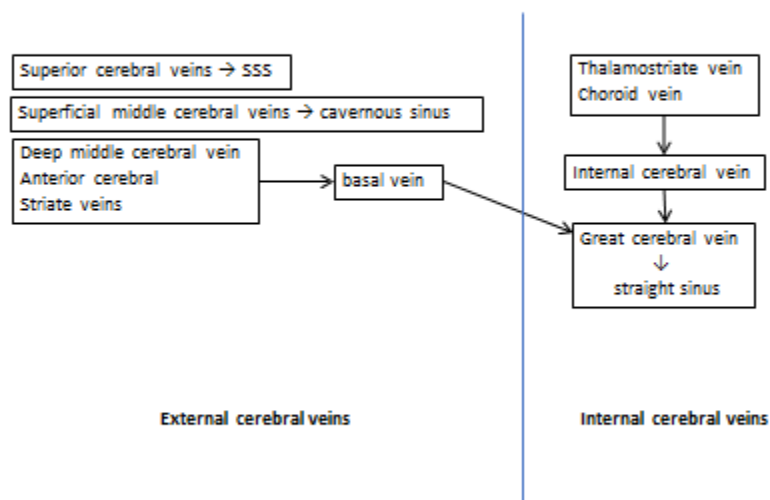
- Motor & somatosensory cortex (lower limb & perineum)
- Corpus callosum (except- splenium, the most posterior part which will be supplied by posterior cerebral artery)
- Olfactory bulb & tract
- Recurrent artery of Heubner
 - Head of caudate (ventral part) and adjacent putamen
 - Internal capsule (anterior limb)



Posterior Cerebral Artery

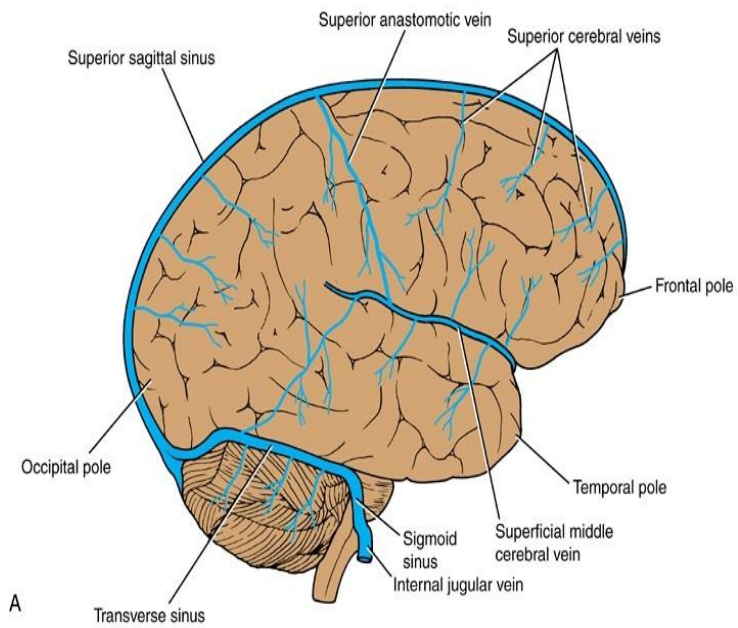
- 1- Hippocampus
 - 2- Parahippocampal gyrus
 - 3- Calcarine branch (through calcarine sulcus)- all primary & some association cortex for vision
- **Posterior choroidal artery**
 - Choroid plexus (lateral & 3rd ventricles)
 - Thalamus (posterior part)
 - Fornix
 - Tectum (posterior part of midbrain)

Veins of the Brain

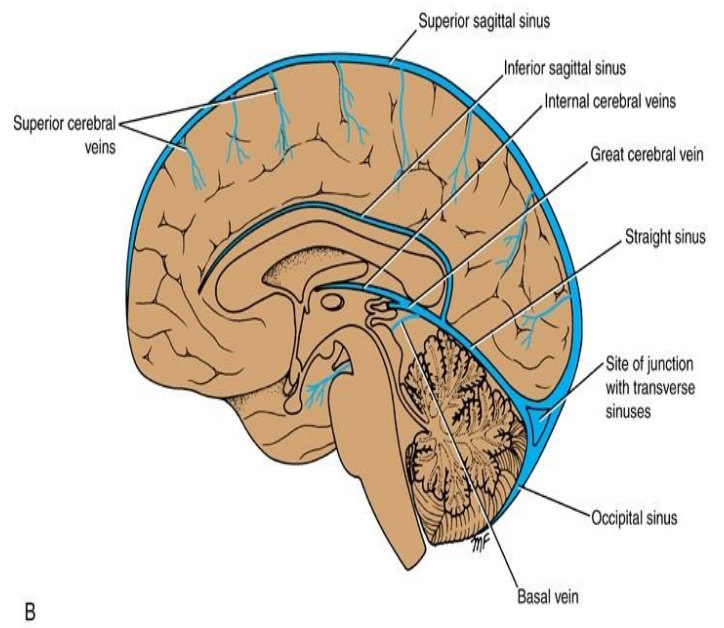


SSS=Superior Sagittal Sinus

- Straight sinus= connection between falx cerebri and tentorium cerebelli, drains into Confluence of sinuses towards the transverse sinus.



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Thank you 😊