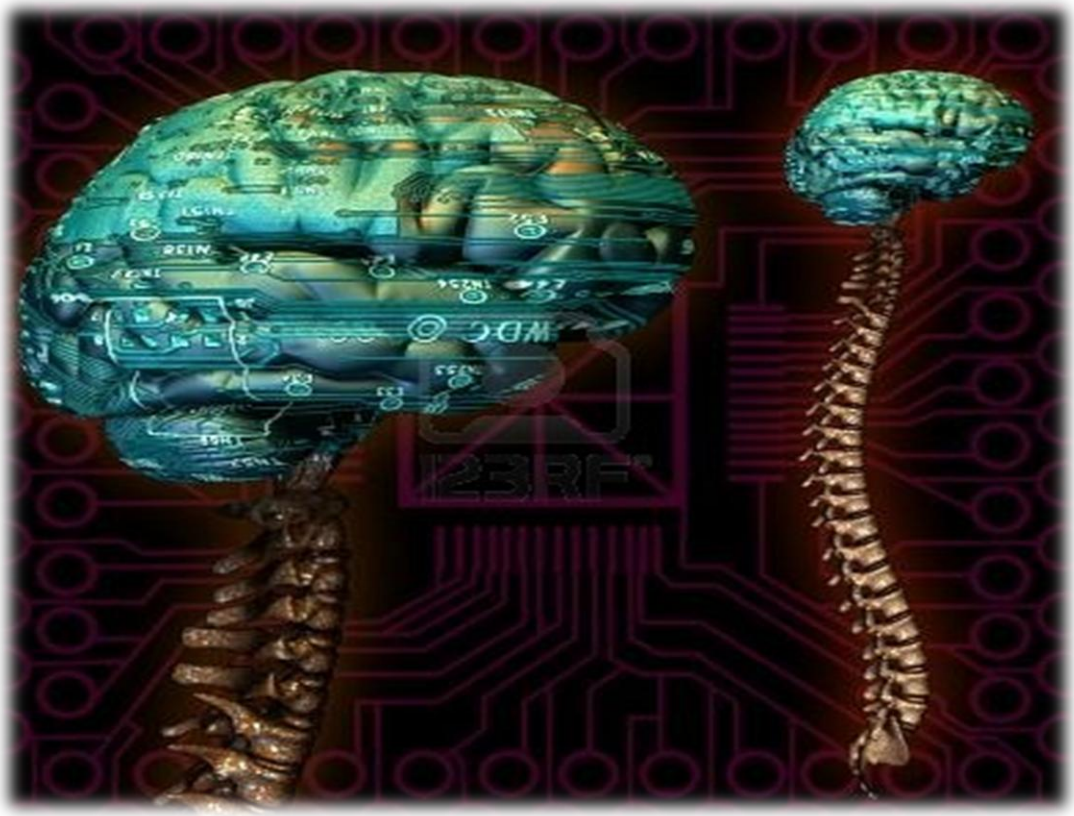
CNS Block



LECTURE (18)

Done by: **Abdullah Alsabti**

Reviewed by: **Leena Al-Yahya**

If there is any mistake please feel free to contact us:

Anatomyteam32@gmail.com

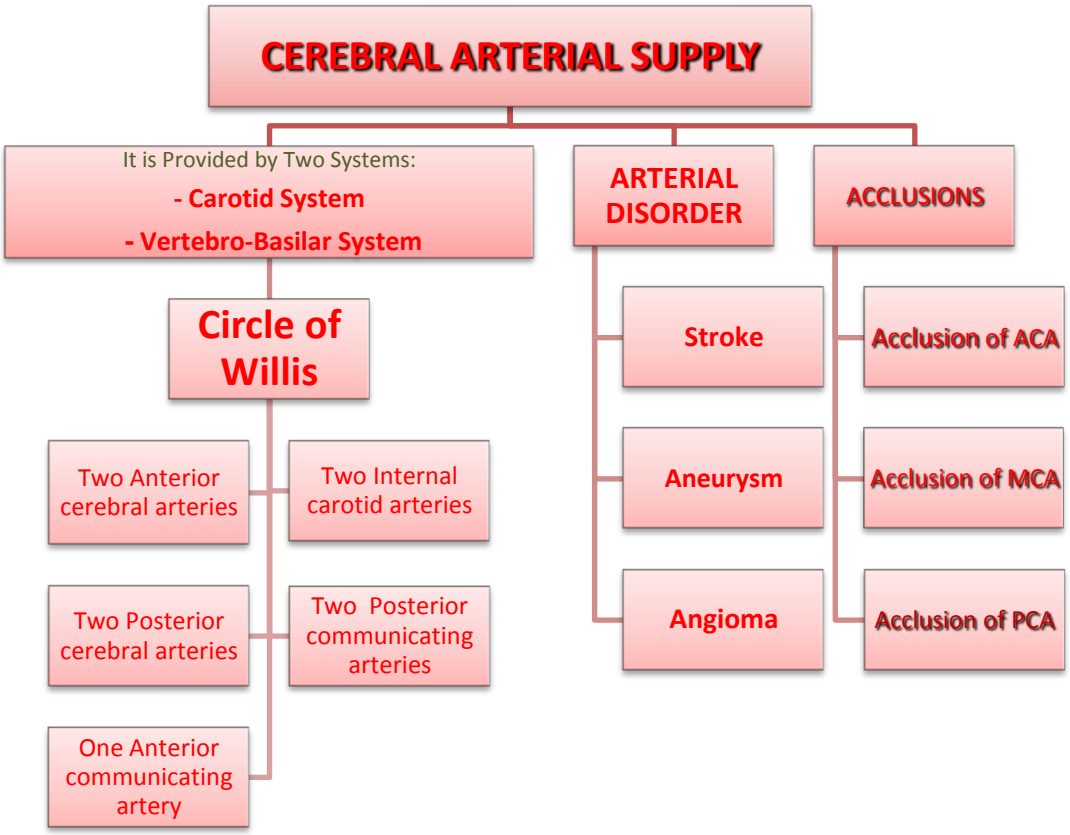
Both - Black
Male Notes - BLUE
Female Notes - GREEN
Explanation and additional notes - ORANGE
Very Important note - Red

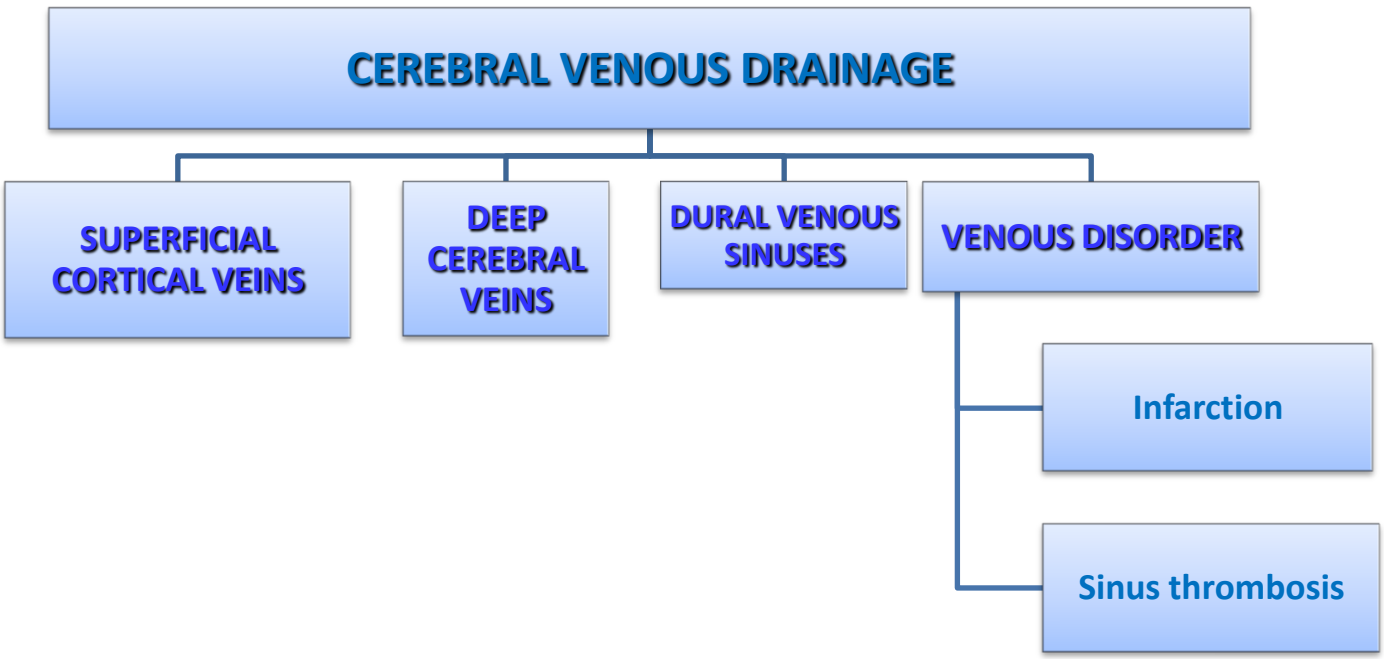
Objectives:

AT THE END OF THE LECTURE, STUDENTS SHOULD BE ABLE TO:

- LIST THE **CEREBRAL ARTERIES**.
- DESCRIBE THE CEREBRAL ARTERIAL SUPPLY REGARDING THE **ORIGIN**, **DISTRIBUTION** AND **BRANCHES**.
- DESCRIBE THE ARTERIAL **CIRCLE OF WILLIS**.
- DESCRIBE **THE CEREBRAL VENOUS DRAINAGE** AND ITS **TERMINATION**.
- DESCRIBE **ARTERIAL & VENOUS VASCULAR DISORDERS** AND THEIR **CLINICAL MANIFESTATIONS**.

MIND MAP


CEREBRAL ARTERIAL SUPPLY
It is Provided by Two Systems:
- Carotid System
- Vertebro-Basilar System
ARTERIAL DISORDER
ACCLUSIONS
Circle of Willis
Two Anterior cerebral arteries
Two Internal carotid arteries
Two Posterior cerebral arteries
Two Posterior communicating arteries
One Anterior communicating artery
Stroke
Aneurysm
Angioma
Acclusion of ACA
Acclusion of MCA
Acclusion of PCA


CEREBRAL VENOUS DRAINAGE
SUPERFICIAL CORTICAL VEINS
DEEP CEREBRAL VEINS
DURAL VENOUS SINUSES
VENOUS DISORDER
Infarction
Sinus thrombosis

CEREBRAL ARTERIAL SUPPLY

It is composed of Two arterial systems :

- **Carotid System :**

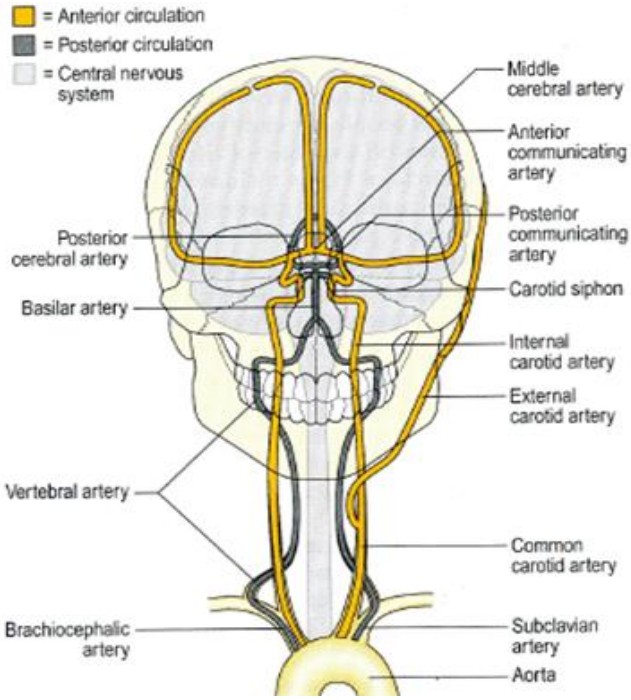
From Aortic arch
↓
left and right common carotid
↓
left and right internal carotid.

It composed of :

The **Anterior** cerebral arteries

The **Middle** cerebral arteries

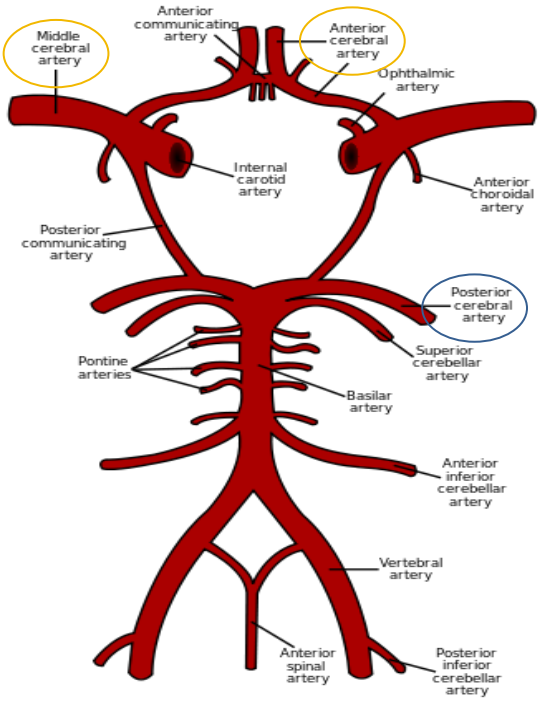
Both are branches of the **Internal carotid artery**



- **Vertebro-Basilar System :**

From Aortic arch
↓
left and right subclavian
↓
left and right vertebral artery
↓
basilar Artery.

It divides at the upper border of the Pons into :



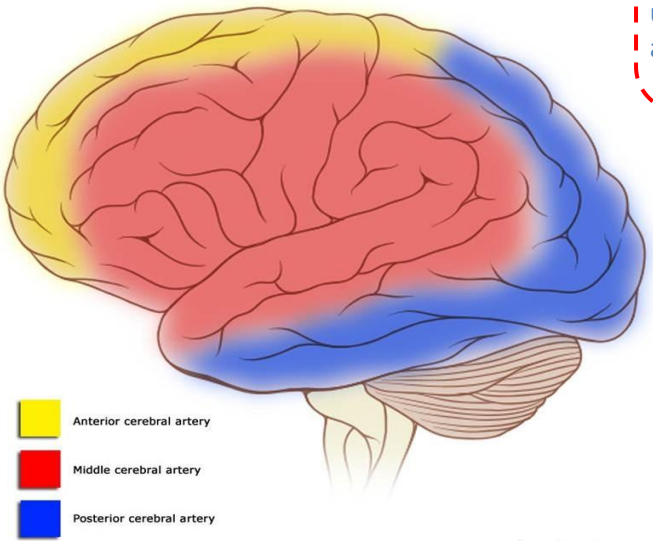
The **Posterior** cerebral arteries

ANTERIOR CEREBRAL ARTERY

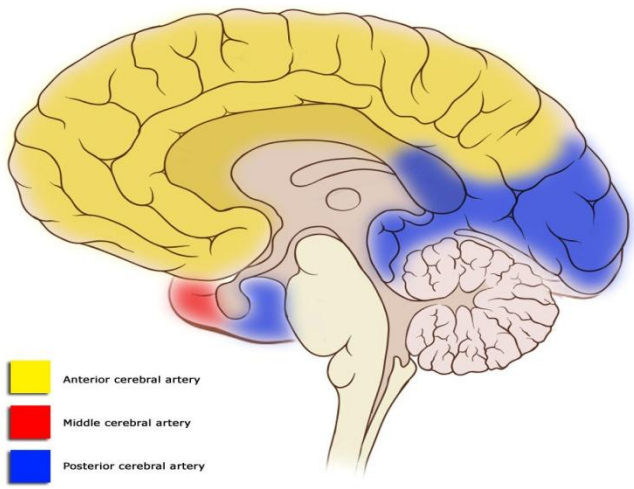
It Supplies :

- **Orbital** and **medial surface** of frontal and parietal lobes.
- A narrow part on the **superolateral** surface .

The superolateral surface of the cerebral H



The medial surface of the cerebral H



MIDDLE CEREBRAL ARTERY

It Supplies : Entire **Superolateral** surface:

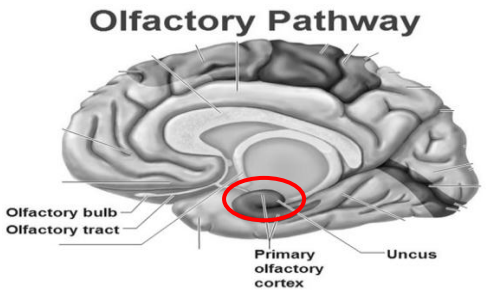
1. **Somatosensory Cortex**
2. **Motor Cortex.**
3. **Language producing areas :**
   - **Broca's Area:** linked to speech production.
   - **Wernicke's Area:** It is involved in the understanding of written and spoken language.
4. **Auditory areas :**
   - **Primery auditory area**
   - **Auditory association (Heschl's Gyrus) :** To process incoming auditory information.

Posterior CEREBRAL ARTERY

It Supplies :

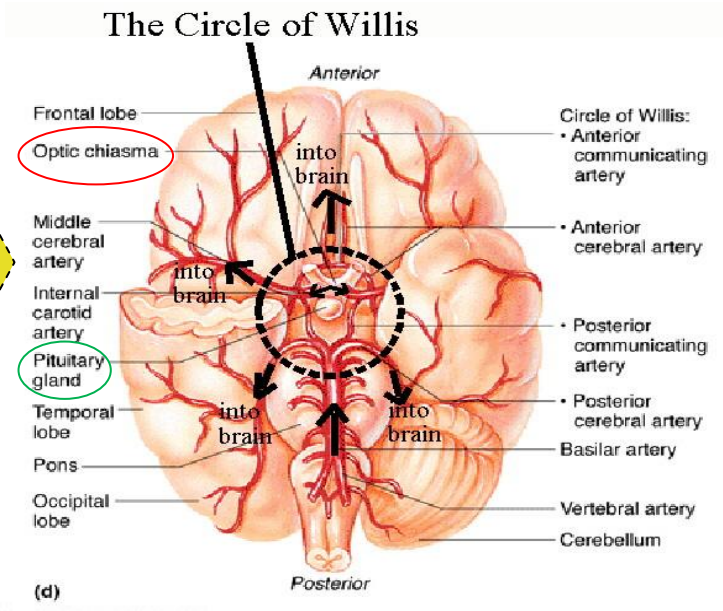
1. **Anterior and inferior** temporal lobes.
2. **Inferior** temporal Gyri.
3. **Inferior and Medial** Occipital lobe (visual areas)
4. **Uncus :**
   Located on the tip end of the medial surface of the parahippocampal gyrus.

   Part of the olfactory cortex that processes information from the sense of smell.



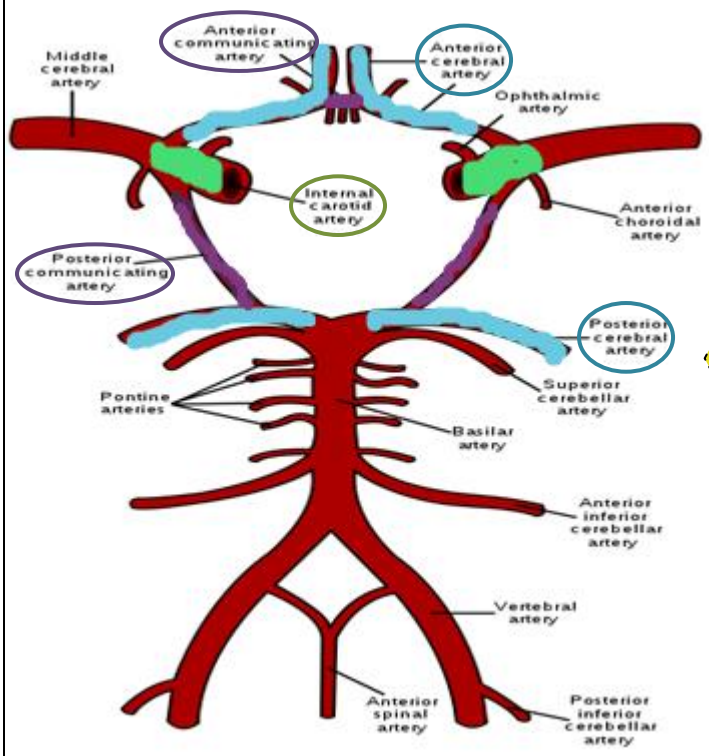
CIRCULUS ARTERIOSUS (OF WILLIS)

The two Systems join at Circle of Willis.
It is Located on the base of the brain.



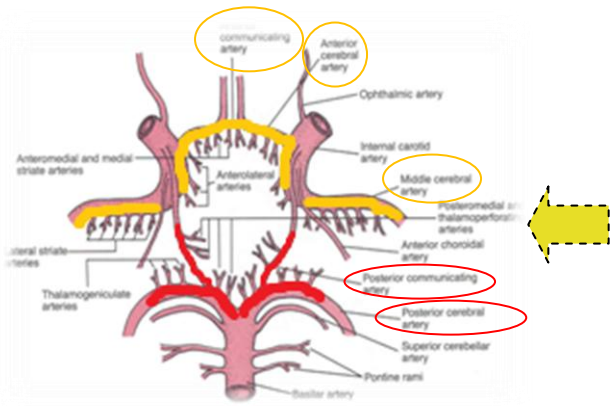
❖ **It Encircles:**

- Optic chiasma.
- Hypothalamus.
- Pituitary gland
- Midbrain.



❖ **It is Formed of :**

- 2 Anterior cerebral arteries
- 2 Internal carotid arteries
- 2 Posterior cerebral arteries
- 2 Posterior communicating arteries
- 1 Anterior communicating artery



❖ **Branches :**

Perforating arteries

It gives numerous small vessels that penetrate the surface of the brain:

They are divided into:

Anterior perforating arteries (APA) :
Supplies –
- Large part of basal Ganglia
- Optic chiasma
- Internal capsule
- Hypothalamus

Posterior perforating arteries (PPA) :
Supplies –
- Ventral portion of Midbrain
- Parts of Subthalamus
- Hypothalamus

APA arise from :
-ACA
-A communicating A
-MCA

PPA arise from :
-PCA
-P communicating A

***APA Enter brain through:**
Anterior perforated substance: irregularly quadrilateral area in front of the optic tract and behind the olfactory trigone.

***PPA Enter brain through:**
Posterior Perforated substance.

Arterial Disorders

Stroke

Sudden occlusion of the blood supply .

It can be :

- Hemorrhage
- Ischemic

Aneurys

localized, blood-filled balloon-like bulge in the wall of a blood vessel.

Angioma

It is benign tumors derived from cells of the vascular or lymphatic vessel walls (epithelium) or derived from cells of the tissues surrounding these vessels.

Effect of occlusion of Cerebral arteries

ACCLUSION OF ACA

Manifestations:

- **Motor** and **sensory disturbances** in the contralateral distal limp
- **Difficulty in the prefrontal lobe functions** :
  Cognitive thinking, judgment, motor initiation and self monitoring

ACCLUSION OF MCA

Manifestations:

- **Contralateral weakness of:**
  face, arm, and hand (more than legs)
- **Contralateral sensory loss of:**
  face, arm, and hand (more than legs)
- **visual field cut**
  (damage to optic radiation)
- **Aphasia: (language disturbances)**
  Broca's: production
  Wernicke's: comprehension

ACCLUSION OF PCA

Manifestations:

- **Visual disturbances:**
  - **Contralateral homonymous hemianopsia.**
  - **In Bilateral lesions: cortical blindness**
    patients unaware they cannot see
    (Anton's syndrome)
- **Memory impairment:**
  If temporal lobe is affected

CEREBRAL VENOUS DRAINAGE

It involves :

❖ **Superficial** (cortical) **veins**:
Found in the **subarachnoid space** .
Drain the cortical surfaces **.**

❖ **Deep veins** :
Drain the deep structures

- Lie on the brain surface

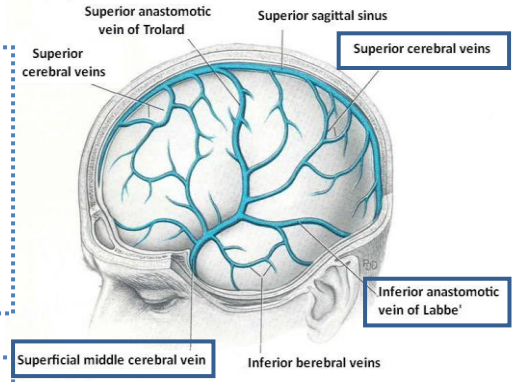
They are divided into:

➢ These veins ultimately drain into:
Dural Venous Sinuses
(They are different from veins by absences of muscular layer).

➢ The Veins are **thin walled** and **devoid of valves.**

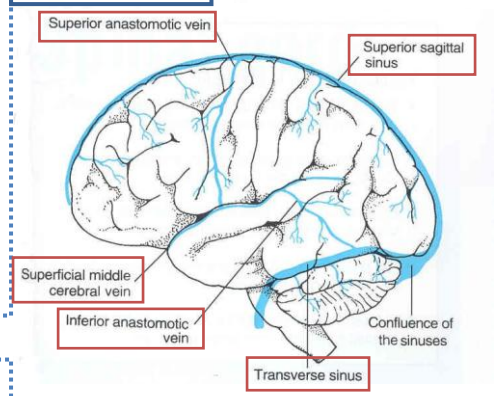
1 Superior Cerebral Veins

- 6 to 12 veins
- Drain lateral surface of brain above the lateral sulcus
- Terminate mainly into the **Superior Sagittal sinus**, and partly into **superficial middle cerebral vein.**



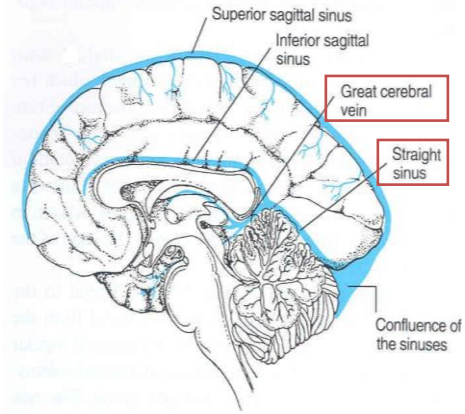
2 Inferior Cerebral Veins

- Run below the lateral sulcus
- Drain the lateral surface of the temporal lobe
- Terminate mainly into **superficial middle cerebral vein** & partly into **Transverse sinus.**



3 Superficial Middle Cerebral Vein

- Runs along the lateral sulcus
- Terminates into the **Cavernous sinus**
- Connected posteriorly by **Superior & Inferior anastomotic veins** to **Superior Sagittal** & **Transverse sinuses** respectively.

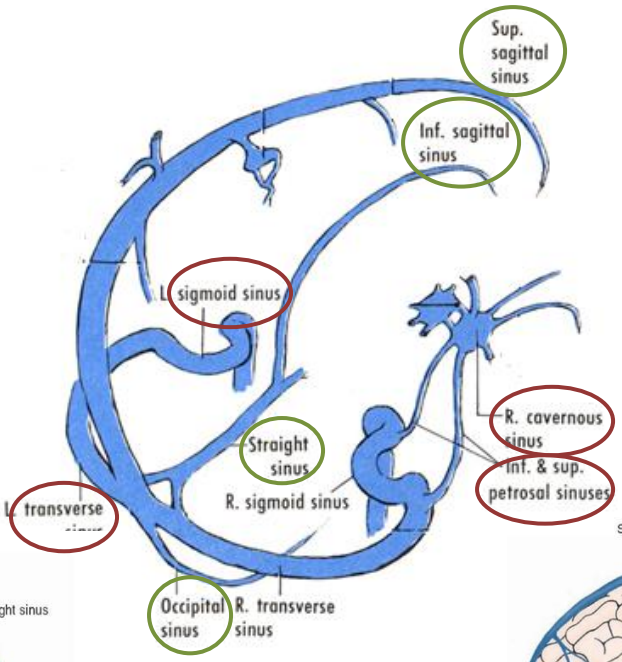


- They drain the internal structures:
  - **Basal ganglia**
  - **Internal capsule**
  - **Thalamus**
- They merge to form two **Internal Cerebral Veins.**
- The two veins unite in the midline to form the **Great Cerebral vein.**
- This short vessel is continuous with the **Straight Sinus.**

DURAL VENOUS SINUSES

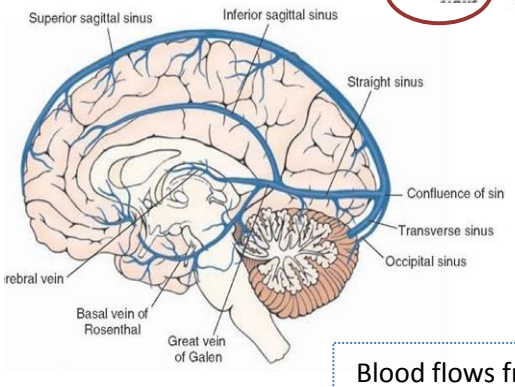
Paired:

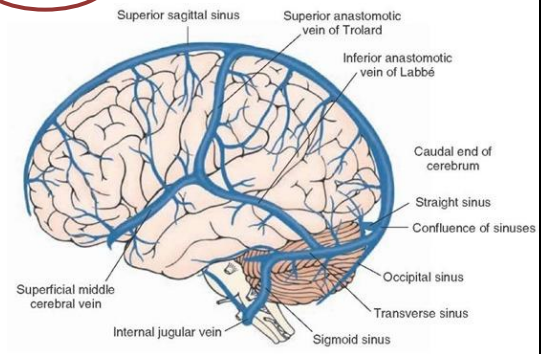
- Transverse
- Sigmoid
- Cavernous
- Petrosal



Single:

- Superior sagittal
- Inferior sagittal
- Straight
- Occipital





Blood flows from **transverse & sigmoid sinuses into IJV**

VENOUS DISORDER

Infarction

refers to tissue death (necrosis) that is caused by a local lack of oxygen due to obstruction of the tissue's blood supply

Sinus thrombosis

Obstruction of venous drainage of the brain leads to **Cerebral swelling (edema)** and **raised Intracranial Pressure**

Cavernous Sinus thrombosis

As a complication of infection in the dangerous area of the face

SSS thrombosis

- Superior Sagittal Sinus
- Can complicates ear infection

Questions

Q1 - If a lesion occurs in the posterior cerebral artery, these deficits may present

a- Paralysis, Contralateral Hemiplegia of the leg, Cognitive and Emotional Changes
b- Dyslexia, Memory Impairments, Hemianopsia, Cortical Blindness
c- Dysarthria, Dysphagia, Locked-In Syndrome
d- Contralateral Hemiplegia, Cortical Hypothesia, Apraxia, Aphasia, Hemianopsia

Q2- the superior cerebral veins terminate into :

a- Transverse sinus
b- superior anastomotic
c- inferior sagittal sinus
d- superior sagittal sinus

Q3- the great cerebral vein form by :

a- inferior cerebral veins
b- superficial middle cerebral vein
c- internal cerebral veins
d- superior cerebral veins

Q4 - The anterior cerebral artery and the middle cerebral artery arise from...

a- the vertebrobasilar artery
b- the brain
c- the internal carotid artery
d- the spinal column

Q5 - If a lesion occurs in the middle cerebral artery, these deficits may present...

a- Paralysis, Contralateral Hemiplegia of the leg, Cognitive and Emotional Changes
b- Contralateral Hemiplegia, Cortical Hypothesia, Apraxia, Aphasia, Hemianopsia
c- Dysarthria, Dysphagia, Locked-In Syndrome
d- Dyslexia, Memory Impairments, Hemianopsia, Cortical Blindness

1- B
2-D
3-C
4-C
5-B

GOOD LUCK

Anatomy Team Leaders:

Fahad AlShayhan & Eman AL-Bediea.