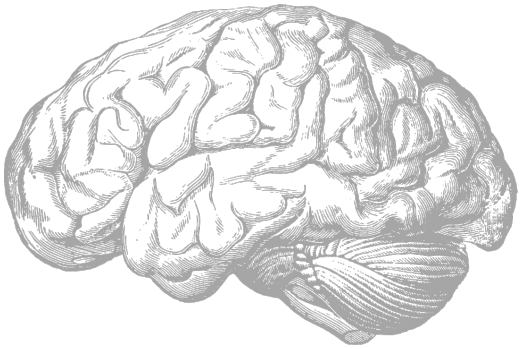
Cerebral Blood Circulation (Arteries and Veins)

CNS Block



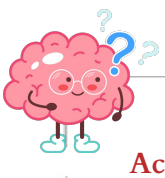
Color Index

- Main Text
- Female Slides
- Male Slides
- Drs' Notes
- Important
- Extra info

The Editing File

Objectives

- List the cerebral arteries.
- Describe the cerebral arterial supply regarding the origin, distribution & branches.
- Describe the arterial circle of willis.
- Describe the cerebral venous drainage and its termination.
- Describe arterial & venous vascular disorders and their clinical manifestations.
- Clinical notes.



Note:

According to the Males' doctor, the important points are in the Females' slides, the extra info in Males' slides are just for knowledge, so we didn't include them in the lecture.

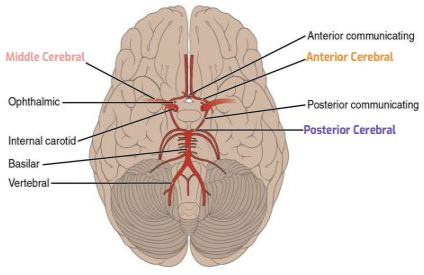
You can find Atlas by Clicking HERE!

Cerebral Arterial Supply

It is composed of TWO Arterial Systems

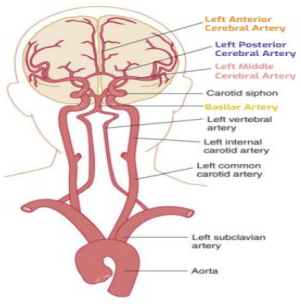
Carotid System

Supply the **Anterior Portion** of brain.
It's composed of:
Internal carotid artery and its branches:
1. Anterior Cerebral Artery
2. Middle Cerebral Artery



Vertebrobasilar System

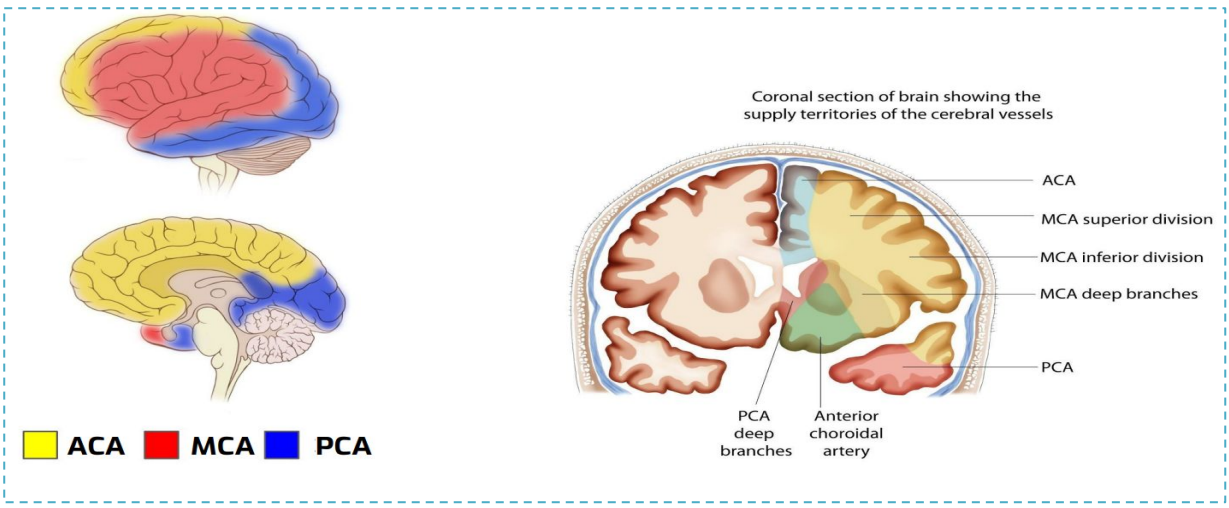
Supply **Posterior Portion** of the brain.
It's composed of the 2 **Vertebral arteries and Basilar artery**:
1. **Vertebral Arteries:**
   Origin: subclavian artery
2. Basilar Artery:
   Origin: the union of 2 vertebral arteries
It divides at the upper border of the pons into two **Posterior Cerebral Arteries**



Blood Supply

✦ Distribution of the cerebral arteries on the superolateral surface of the cerebral H.

Origin	Internal Carotid Artery		Basilar Artery
Branch	**Anterior** Cerebral Artery **(ACA)**	**Middle** Cerebral Artery **(MCA)**	**Posterior** Cerebral Artery **(PCA)**
Supplies	1) Orbital and medial surfaces of **frontal** and **parietal** lobes. 2) A narrow part on the Supplies **superolateral surface.**	Entire Superolateral surface: 1) Somatosensory Cortex 2) Motor Cortex 3) Language 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: -Primary auditory area (Heschl's Gyrus) process incoming auditory information -Auditory association	1) Inferior medial (Anterior and inferior) **temporal lobes,** 2) 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. 3) Inferior temporal gyri 4) Inferior and Medial **Occipital lobe** (visual area)

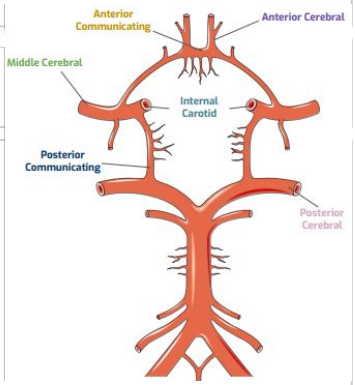


Circulus Arteriosus (Circle of Willis)

Circle of Willis

It joins the **carotid** and **vertebrobasilar** systems

It is located at the **base** of the brain

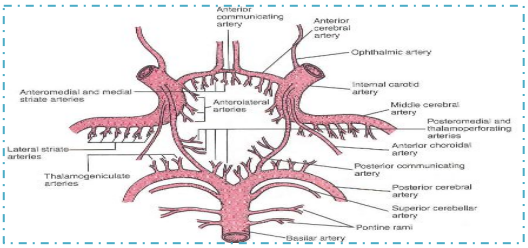


It encircles:
Optic Chiasma, Hypothalamus, Midbrain & Pituitary gland.
➔ It is composed of:

- Two Anterior Cerebral Arteries
- Two Internal Carotid Arteries
- Two Posterior Cerebral Arteries
- Two Posterior Communicating Arteries
- One Anterior Communicating Artery

Males doctor: always in exams they ask: is the middle cerebral artery part of the circle of willis? NO!

Branches



Perforating arteries (Anterior & Posterior):

- Numerous small vessels that penetrate the surface of the brain through the anterior and posterior perforating substances.

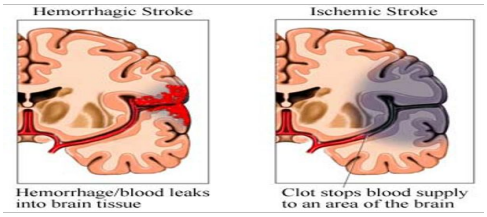
Anterior Perforating Arteries (APA)

- **Arise from: Anterior cerebral, anterior communicating & middle cerebral arteries**
- **Entrance:** to the brain through anterior perforating substance
- **Supplies:** Large part of basal ganglia, Optic chiasma, Internal capsule & Hypothalamus

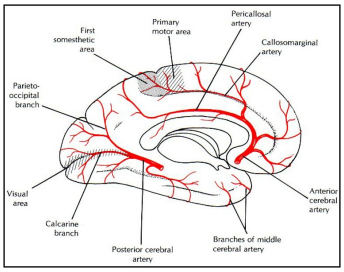
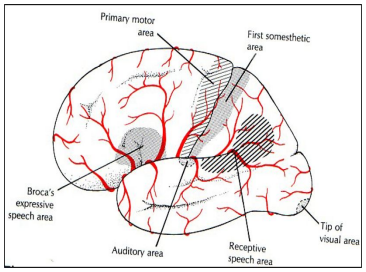
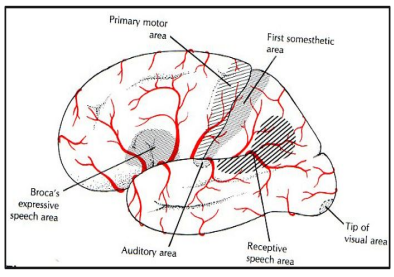
Posterior Perforating Arteries (PPA):

- **Arise from:** Posterior cerebral and posterior communicating arteries
- **Entrance:** to the brain through the posterior perforating substance
- **Supplies**: Ventral portion of Midbrain, parts of Subthalamus & Hypothalamus

Arterial Disorders

Stroke	Sudden occlusion of the blood supply. It can be: 1. Hemorrhagic 2. Ischemic 
Aneurysm	It 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

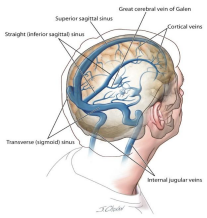
ACA Occlusions	MCA Occlusions	PCA Occlusions
▪ **Motor & sensory disturbances in the contralateral distal leg.** ▪ **Difficulties in the prefrontal lobe functions:** • Cognitive thinking • Motor initiation • Judgment • Self monitoring 	▪ **Contralateral weakness of:** • face, arm, and hand more than 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 	▪ **Visual disturbances** • Contralateral homonymous hemianopia (in optic tract) • **Bilateral lesions:** cortical blindness - Patients unaware they can't see (Anton's syndrome) ▪ **Memory impairment** • If temporal lobe is affected . 

Cerebral Venous Drainage

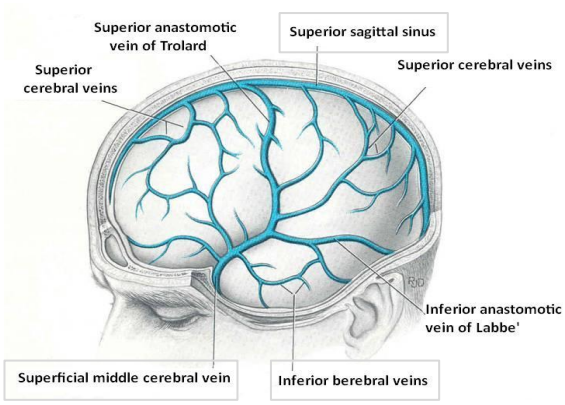
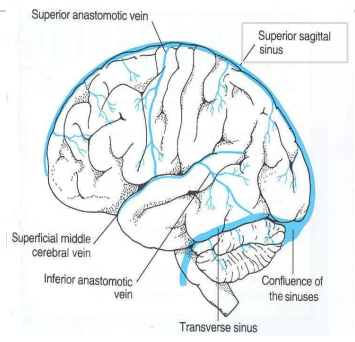
1. These veins are thin walled and are devoid (lack) of valves

2. **It Divided into:**
   1. **Superficial Cortical Veins:** found in the subarachnoid space, drain the cortical surfaces
   2. **Deep Cortical Veins:** Drain the deeper structures

3. They ultimately drain into the dural venous sinuses.



Superficial vein

	Superior cerebral veins (6-12 veins)	Inferior cerebral veins	Superficial middle cerebral veins
Course	Runs above the lateral sulcus	Run below the lateral sulcus	Runs along the lateral sulcus
Termination	**Mainly** into the Superior Sagittal sinus **Partly** into superficial middle cerebral vein	**Partly** into superficial middle cerebral vein **Partly** into Transverse sinus	Terminates into the Cavernous sinus
Drainage/ Notes	Drains the lateral surface of the the brain above the lateral sulcus	Drain the lateral surface of the temporal lobe	It is connected posteriorly by **Superior & Inferior anastomotic veins** to **Superior Sagittal & Transverse sinuses** respectively
Picture			

Deep Cerebral veins

Drain the internal structures
1 - Basal ganglia
2- Internal capsule
3- Thalamus

They merge to form two **Internal Cerebral Veins**

The two veins unite in the midline to form the **Great Cerebral Vein**

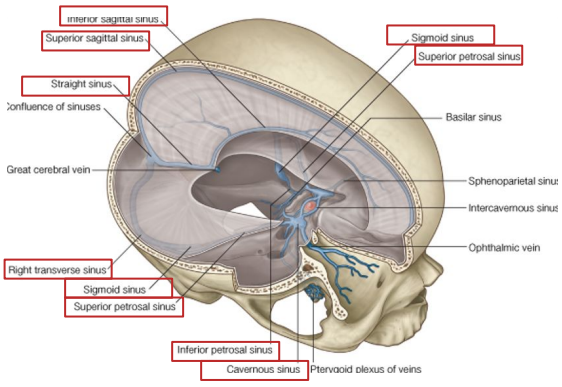
This short vessel joints the Inferior Sagittal Sinus to form the **Straight Sinus**

Dural venous sinuses

Dural venous sinuses — MCQ

Paired Sinuses

- Transverse sinus
- Sigmoid sinus
- Cavernous sinus
- Superior petrosal sinus
- Inferior petrosal sinus



Single Sinuses

- Superior sagittal sinus
- Inferior sagittal sinus
- Straight sinus
- Occipital sinus

Female doctor: Dural venous sinuses are important clinically

Blood flows from transverse & sigmoid sinuses into IJV.

Venous Disorders

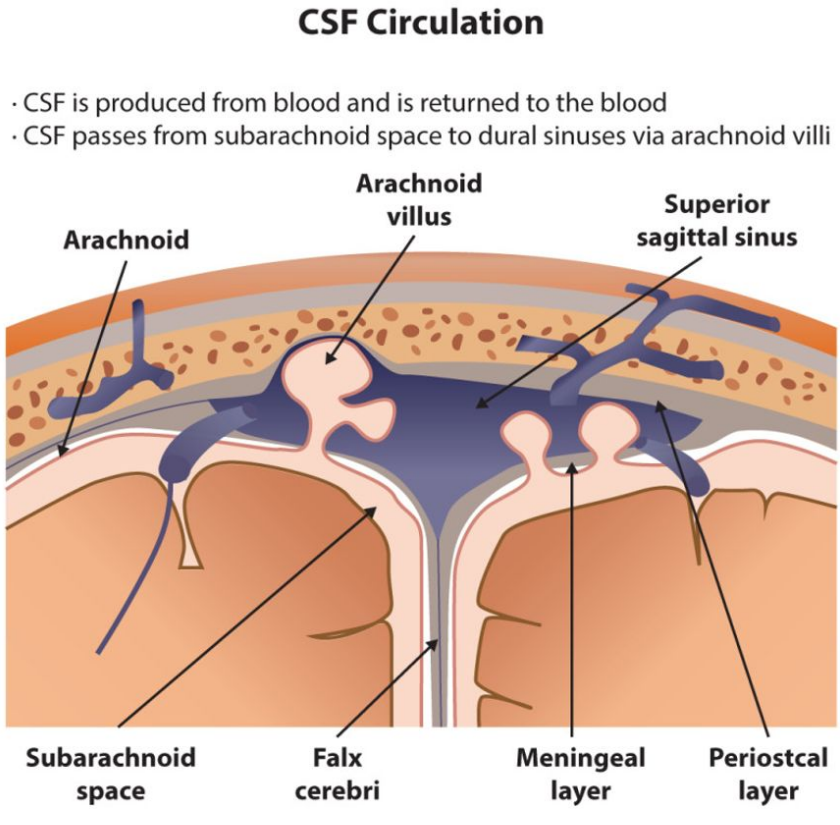
Infarction

Sinus thrombosis

SSS Thrombosis
can complicates ear infection. (not common)

Cavernous Sinus Thrombosis
as a complication of infection in the dangerous area of the face

Cerebral Edema
Obstruction of venous drainage of the brain leads to cerebral edema and raised ICP.



MCQs

Q1. Which one of the following is affected in case of occlusion of the anterior cerebral artery?			
A. Cognitive thinking and judgment	B. Comprehension of the spoken words	C. Hearing	D. Movement of the arm
Q2. Which one of the following arteries supply the internal capsule?			
A. Anterior perforating artery	B. Posterior cerebral artery	C. Basilar artery	D. Posterior communicating artery
Q3. Which of the following sinuses drains the inferior cerebral vein?			
A. Superior sagittal sinus	B. Straight sinus	C. Sigmoid sinus	D. Transverse sinus
Q4. Which one of the following is affected in case of occlusion of the posterior cerebral artery?			
A. Speech	B. Touch	C. Primary vision	D. Auditory
Q5. Which of the following cerebral arteries supplies motor area of speech?			
A. Anterior cerebral artery	B. Middle cerebral artery	C. Posterior cerebral artery	D. Basilar artery
Q6. Which one of the following sinuses receives the great cerebral?			
A. Cavernous sinus	B. Sigmoid sinus	C. Straight sinus	D. Superior sagittal sinus

A1. A A2. A A3. D A4. C A5. B A6. C

FOR ANKI FLASHCARDS

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Nazmi M Alqutub

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Mansour Alotaibi

Khalid Alsobei

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