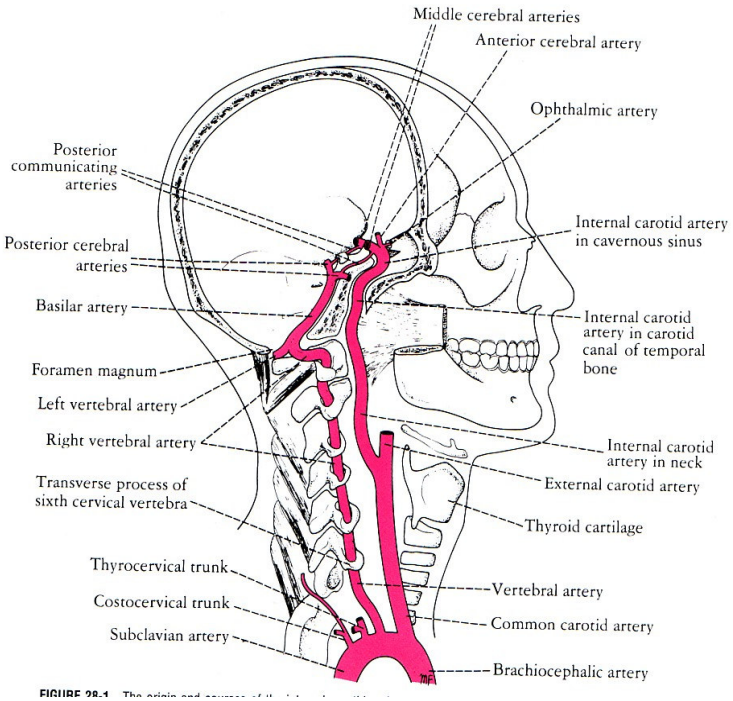
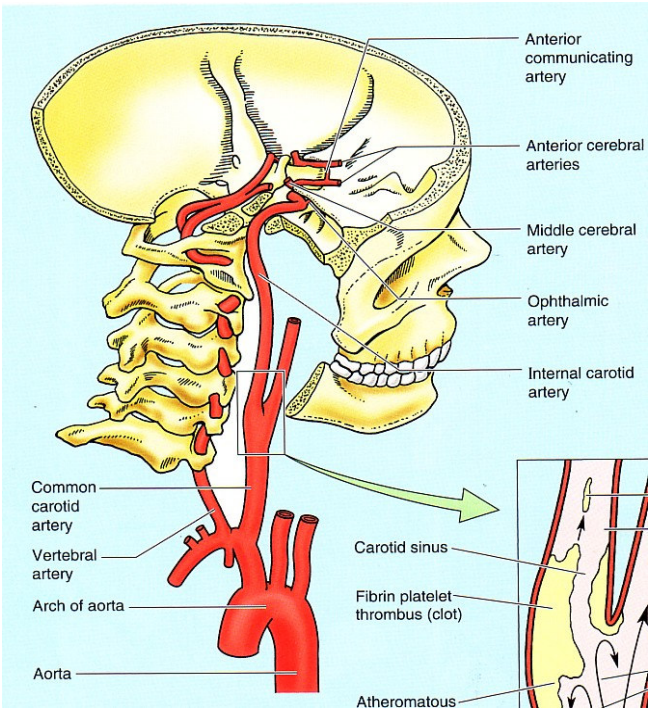
BRAIN BLOOD SUPPLY

ARTERIAL SUPPLY OF THE BRAIN :

- Four arteries enter the cranial cavity to supply the brain.
  - Two vertebral arteries.
  - Two internal carotid arteries.





CIRCULUS ARTERIOSUS OF WILLIS :

- It is a Hexagonal arterial circle in the Interpeduncular Fossa, surrounding the Optic Chiasma.
- It is formed by **9 Arteries :**
  - **2** ACA (Ant. Cerebral).
  - **2** ICA (Int. carotid).
  - **2** PCA (Post. Cerebral).
  - **2** Post. Communicating.
  - **1** Ant. Communicating.

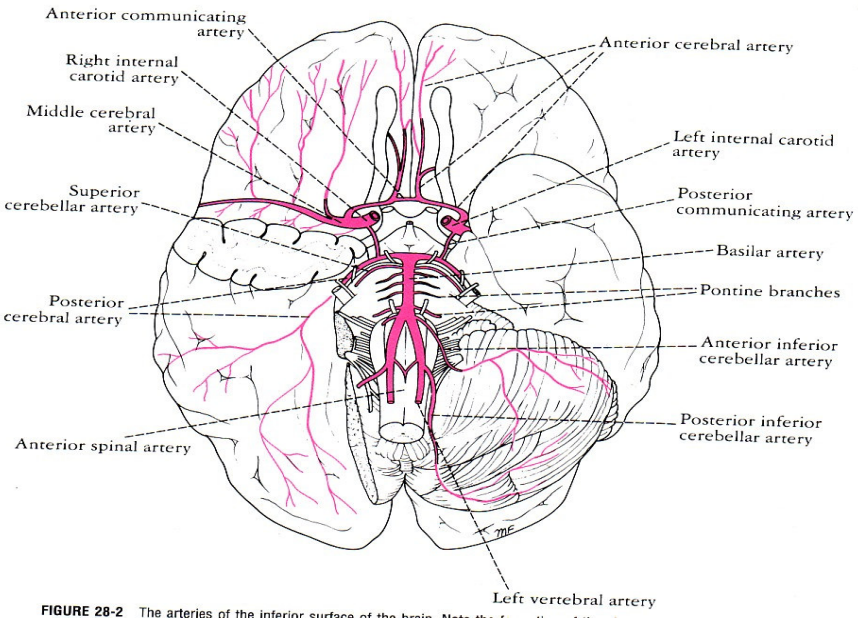


FIGURE 28-2 The arteries of the inferior surface of the brain.

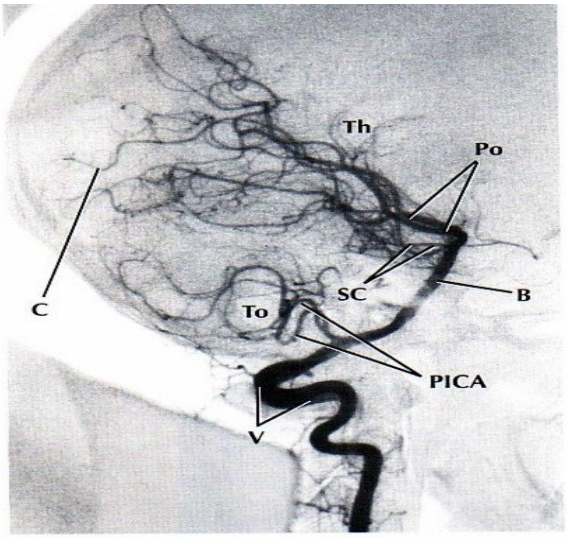
- **Function of Circulus Arteriosus of Willis :**
  It allows blood of either ICA or Vertebral arteries to be distributed to any part of cerebral hemispheres.
- NB. It is the most common site of arterial aneurysm (at the sits of meting of 2 arteries), where the media becomes a weak point.

VERTEBRAL ARTERY :

- Branch of 1st part of subclavian artery.
- Its course is divided into 4 parts.
- The 4th part enters the cranial cavity through the foramen magnum.
- The two vertebral arteries unite at the lower border of the Pons to form the **Basilar** artery.
- **Branches of vertebral artery :**
  1. **Medullary branches.**
  2. **Anterior spinal artery.**
  3. **Posterior spinal artery.**
  4. **Posterior inferior cerebellar artery (PICA).**

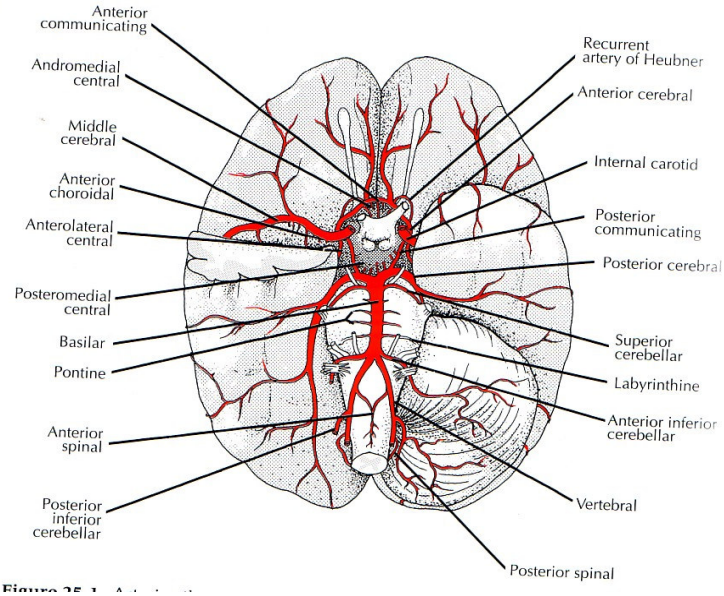
Basilar artery

- PICA
- Vertebral artery



BASILAR ARTERY :

- It is formed at the lower border of front of Pons.
- Ascends in the basilar groove.
- Ends at the upper border of Pons by dividing into 2 posterior cerebral arteries.
- **Branches :**
  1. **Anterior inferior cerebellar artery (AICA).**
  2. **Superior cerebellar artery.**
  3. **Labyrinthine artery.**
  4. **Pontine branches.**
  5. **Posterior cerebral artery.**



INTERNAL CAROTID ARTERY :

- Enters the cranial cavity through the carotid canal.
- It runs in the floor & Anterior wall of the cavernous sinus, **where** it gives its hypophyseal branch.
- It leaves the cavernous sinus as it pierces the dura and arachnoid medial to the anterior clinoid process, lateral to the optic chiasma.
- Lateral to optic chiasma it divides into anterior & middle cerebral arteries.
- Just before its termination it gives :
  - **Ophthalmic.**
  - **Posterior communicating.**
  - **Anterior choroid artery.**

CEREBRAL ARTERIES :

- Each cerebral hemisphere is supplied by 3 arteries (Anterior, Middle, and Posterior).

A) Anterior Cerebral Artery :

- The smaller of the 2 terminal branches of the ICA.
- It arises below the anterior perforated substance.
- It passes forward and medially above the optic chiasma, to reach the median longitudinal fissure.
- It turns upwards in the groove to reach the medial surface to lie below rostrum of corpus callosum.
- It curves upward in the callosal sulcus above the genu and body of the corpus callosum.

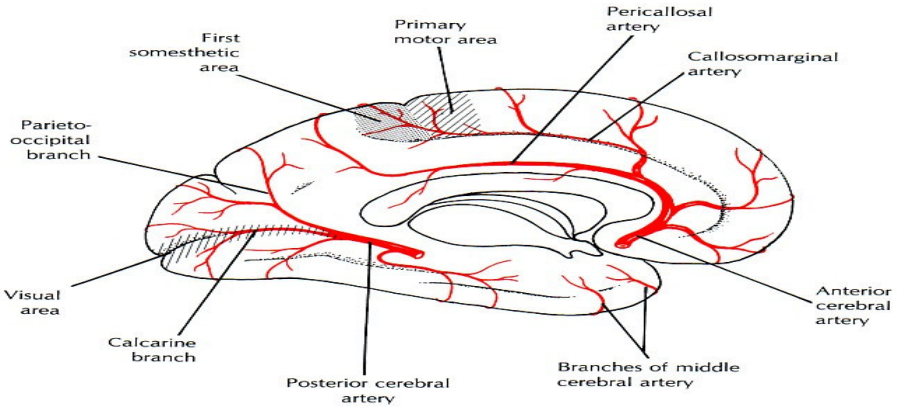
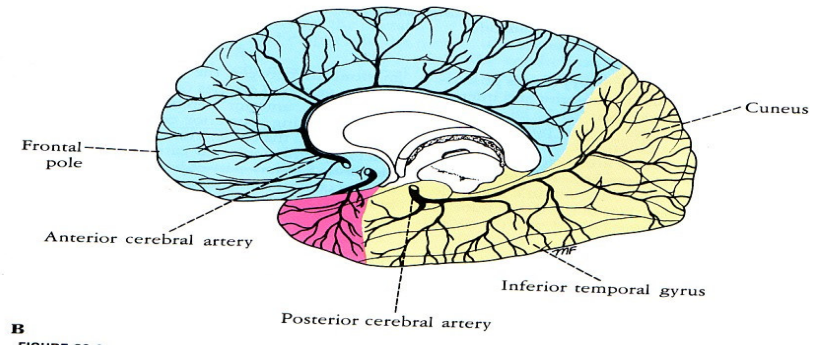


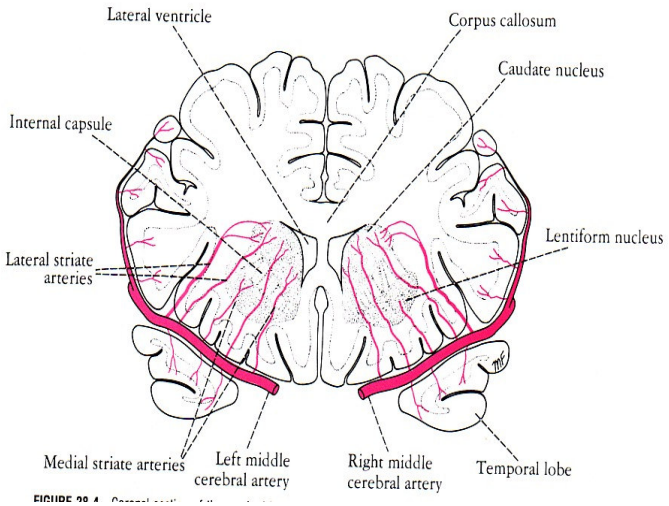
Figure 25-3. Distribution of the anterior and posterior cerebral arteries on the medial surface of the left cerebral hemisphere.



- **Branches :**
  - **a. Cortical branches to** :
    1. Medial surface of brain from frontal pole to parieto-occipital sulcus.
    2. Upper one inch of superolateral surface as far as upper end of parieto-occipital sulcus.
    3. Medial 1/2 of orbital surface of frontal lobe.
  - **b. Callosal branches** : To all parts of corpus callosum except Splenium.
  - **c. Central branches :**
    1. Anterior part of corpus striatum.
    2. Anterior part of anterior limb of internal capsule.
    3. Septal region including septum Pelucidum.
- **Clinical importance :** The anterior cerebral artery supplies 3 important areas :
  1. Motor and sensory areas of the lower limb in the Paracentral lobule & upper one inch of superolateral surface.
  2. Septal area where small lesion may result in prolonged unconsciousness.
  3. Corpus callosum : obliteration of its blood may result in **Apraxia** (inability to perform purposeful movement inspite of intact muscles).

B) Middle Cerebral Artery :

- Larger of the 2 terminal branches of ICA.
- It arises just below the anterior perforated substance.
- It passes laterally in the stem of lateral sulcus.
- Then it runs backwards in posterior ramus of lateral sulcus over the **Insula,** where it terminates.



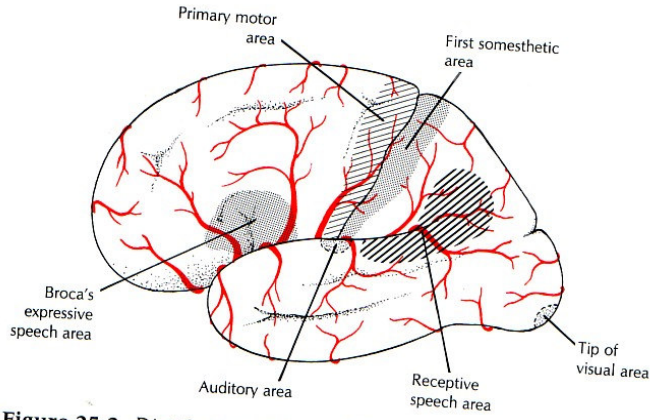
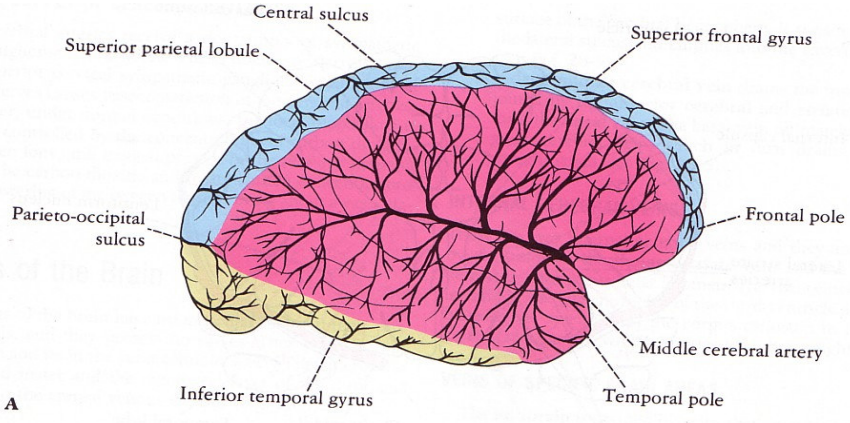


Figure 25-2. Distribution of the middle cerebral artery on the lateral surface of the left cerebral hemisphere. Terminal branches of the anterior and posterior cerebral arteries are also visible.

- **Branches :**
  - **a. Cortical branches :**
    1. To whole of lateral surface Except the upper one inch, along the upper border (ACA), lateral surface of occipital lobe, and a narrow strip along the inferior border (PCA).
    2. Lateral half of orbital surface.
    3. Temporal bole and Insula.
  - **b. Central branches** : They are called striate arteries.
    - Penetrate the anterior perforated substances to supply; Corpus striatum, post.1/2 of anterior limb, Genu, and anterior part of posterior limb of internal capsule.
- NB. One of central branches is larger and called artery of cerebral hemorrhage (**Charcot's artery**), it is the most susceptible artery to rupture in the brain.



- **Clinical importance :** it supplies :
  1. Motor & Sensory areas for the whole body except that for lower limbs (Leg).
  2. Auditory area in superior temporal gyrus.
  3. Motor speech area in inferior frontal gyrus.
  4. Most of the Internal capsule.
  5. Receptive speech area in inferior parietal lobule.
- **<u>Obstruction</u>** of MCA leads to **Hemiplegia.**

Figure 25-5. Carotid angiogram (lateral view). *A* = carotid siphon; *B* = branches of the middle cerebral artery; *C* = anterior cerebral artery. *(Courtesy of Dr. J.M. Allcock)*

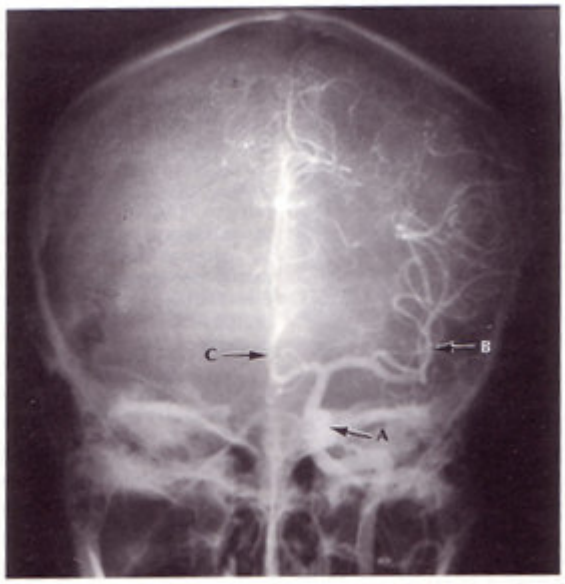


Figure 25-6. Carotid angiogram (anteroposterior view). *A* = carotid siphon; *B* = branches of the middle cerebral artery; *C* = anterior cerebral artery. *(Courtesy of Dr. J.M. Allcock)*

Carotid Siphon

C) Posterior Cerebral Artery :

- It arises at the upper border of Pons, as one of the two terminal branches of basilar artery.
- It passes backward curving around the side of cerebral peduncle, to reach the tentorial surface.
- Then it reaches the medial surface of occipital lobe, where it breaks into terminal branches.

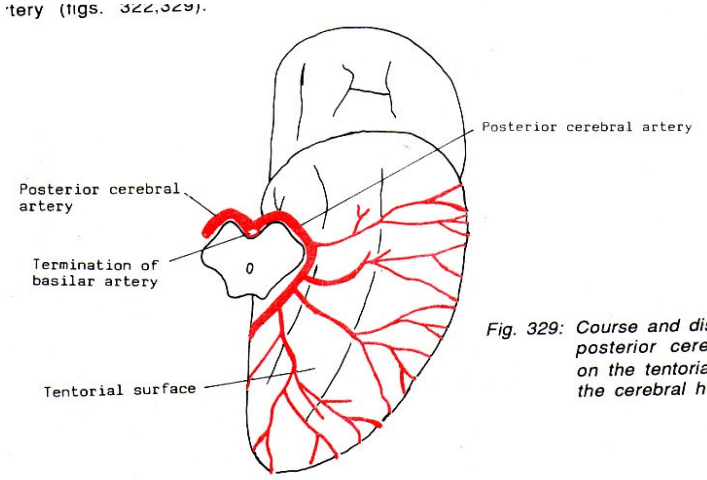
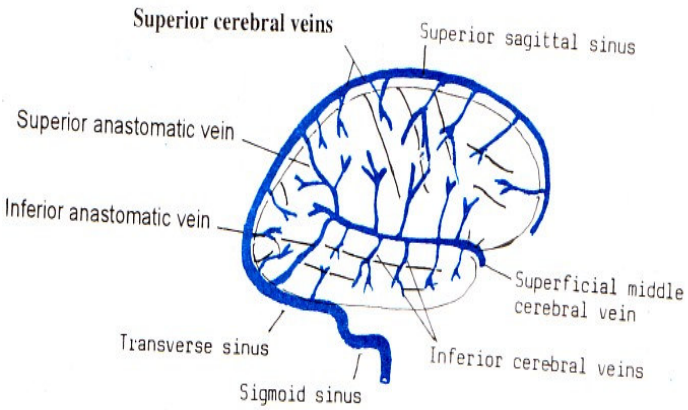


Fig. 329: Course and distribution of posterior cerebral artery on the tentorial surface of the cerebral hemisphere.

- **Branches :**
  - **a. Cortical branches :** It supplies :
    1. Tentorial surface behind temporal pole.
    2. All surfaces of the occipital lobe.
    3. A narrow strip on lateral surface along the inferior border.
  - **b. Central branches :**
    1. **Short medial group** : Supply cerebral peduncle mammilary bodies, subthalamic region& anterior part of thalamus.
    2. **Long lateral group** : Supply Geniculate bodies posterior part of thalamus and pineal body.
  - **c. Posterior Choroidal artery** : To choroid plexus of lateral and 3rd ventricles.
- **Clinical Importance :** it supplies :
  1. **Smell centre in the Uncus.**
  2. **Whole of the Visual Cortex.**

VEINS OF CEREBRAL HEMISPHERE :

- Its wall are devoid of muscle.
- It has no valves.
- In order to maintain patency, some of them open in the dural venous sinuses.
- Most of them lie on the brain surface, on subarchnoid space. (few arise inside the brain).

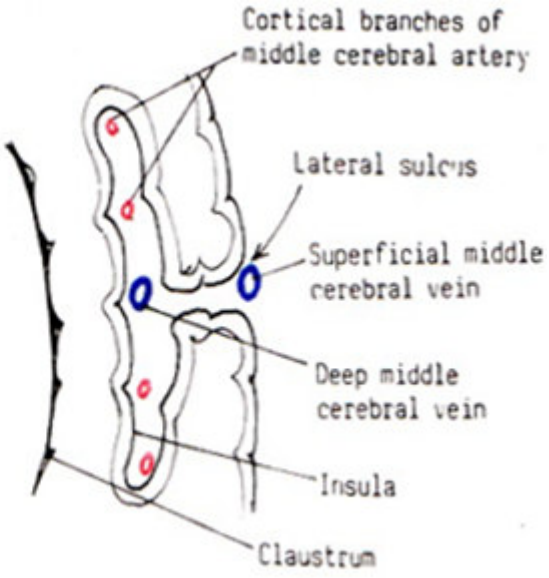


VEINS OF CEREBRUM :

- Cerebrum is drained by 3 set of veins :
  1. Superficial cerebral veins.
  2. Deep cerebral veins.
  3. Dural venous sinuses.

1. **Superficial cerebral veins :**
   a. **Superior cerebral veins :** 6 to 12 veins, they terminate partly in the superior sagittal sinus, and partly into superficial middle cerebral vein.
   b. **Inferior cerebral veins :** Run below lateral sulcus, and drain partly into superficial middle cerebral vein & partly into transverse sinus.

Corronal section showing the positions of the superficial and deep middle cerebral veins in relations to the lateral sulcus and insula.



   c. **Superficial middle cerebral vein :**
      - Runs in posterior ramus of lateral sulcus.
      - It is connected posteriorly by superior & inferior anastomotic veins to superior sagittal & transverse sinuses respectively.
      - Its anterior end runs in stem of lateral sulcus to terminates in cavernous sinus.

2. **Deep Middle cerebral vein :**
    - Formed by union of veins on the surface of Insula.
    - It runs in the depth of lateral sulcus with MCA.
    - At the anterior perforated substance it share in formation of basal vein.
- **Anterior cerebral vein :** Runs with **ACA**, along the corpus callosum, it also share in formation of basal vein.

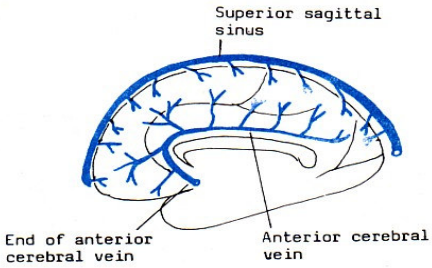
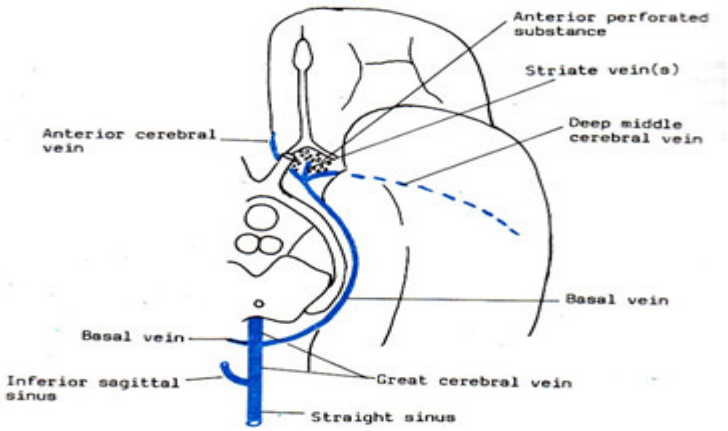
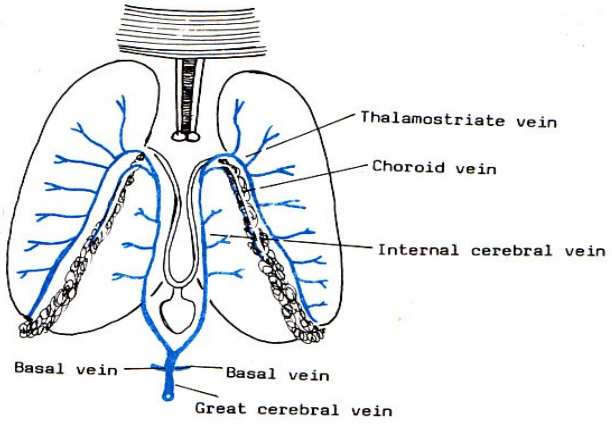


Fig. 335: Veins on the medial surface of the cerebral hemisphere.

- **Striate vein :** One or two veins which drain corpus striatum, it joins the **ACV** & **deep MCV** to form **Basal vein.**

FORMATION OF BASAL VEIN :





- It is formed below the anterior perforated substance by union of **3 veins :**
    1. **Anterior cerebral vein.**
    2. **Deep middle cerebral vein.**
    3. **Striate vein or veins.**
- It curves around the Midbrain to end in **Great cerebral vein.**

THALAMOSTRIATE VEIN :

- One on each side, which begins in the amygdaloid complex.
- It receives **veins** from thalamus, corpus striatum, and internal capsule.
- It joins the choroid veins behind the interventricular foramen to form internal **cerebral vein.**
- The 2 **internal cerebral veins** unite to form the **Great cerebral veins.**

THE END

LoveTomy Team 426

Team leader : Dr. hams

Dr. S Dr. noop Omar H

ابتسم !! همي بروحي

M.A.M Abo Slo7 Cute Killer

SELF QUIZ

1- All the following are Circulus Arteriosus of Willis EXCEPT :
a. 2 Anterior Cerebral artery.
b. 2 Internal Carotid artery.
c. 2 Posterior Cerebral artery.
d. 2 Posterior Communicating artery.
e. 2 Anterior Communicating artery.

2- One of the following arteries is a branch of the basilar artery :
a. Anterior inferior cerebellar artery.
b. Posterior inferior cerebellar artery.
c. Anterior spinal artery.
d. Posterior spinal artery.
e. Radicular arteries to the cervical part of the spinal cord.

3- All the following are union to form Great cerebral vein EXCEPT :
a. Anterior cerebral vein.
b. Deep middle cerebral vein.
c. Striate vein.
d. Basal vein.
e. Superior cerebral veins.

4- One of the following is a branch of the vertebral artery :
a. Anterior cerebral artery.
b. Anterior inferior cerebellar artery (AICA).
c. Posterior inferior cerebellar artery (PICA).
d. Superior cerebellar artery.
e. Posterior cerebral artery.

5- The anterior cerebral artery supplies all of the following EXCEPT :
a. Upper one inch of the parietal lobe.
b. Medial surface of the frontal lobe.
c. Anterior limb of the internal capsule.
d. Anterior part of the corpus striatum.
e. Occipital lobe.

6- One of the following arteries is not part of the circulus arteriosus :
a. Anterior cerebral artery.
b. Middle cerebral artery.
c. Posterior cerebral artery.
d. Anterior communicating artery.
e. Posterior communicating artery.

7- Regarding the cerebral arteries, one of the following is INCORRECT :
a. They are present in the subarachnoid space.
b. Occlusion of the right anterior cerebral artery may cause paralysis of the left upper limb.
c. The anterior cerebral artery courses in the callosal sulcus.
d. The middle cerebral artery courses in the lateral sulcus.
e. The posterior cerebral artery courses in the calcarine sulcus.

1. e	2. a	3. e	4. c	5. e	6. b	7. b

TRUE (OR) FALSE

1- Regarding to cerebral circulation :
a. The posterior inferior cerebellar artery arises from the posterior cerebral artery.
b. The internal capsule is supplied by penetrating branches arising from the middle cerebral artery.
c. The posterior cerebral artery arises from the internal carotid artery.
d. The lateral aspect of each cerebral hemisphere is supplied mainly by the middle cerebral artery.

a. F	b. T	c. F	d. T