



Central Nervous System

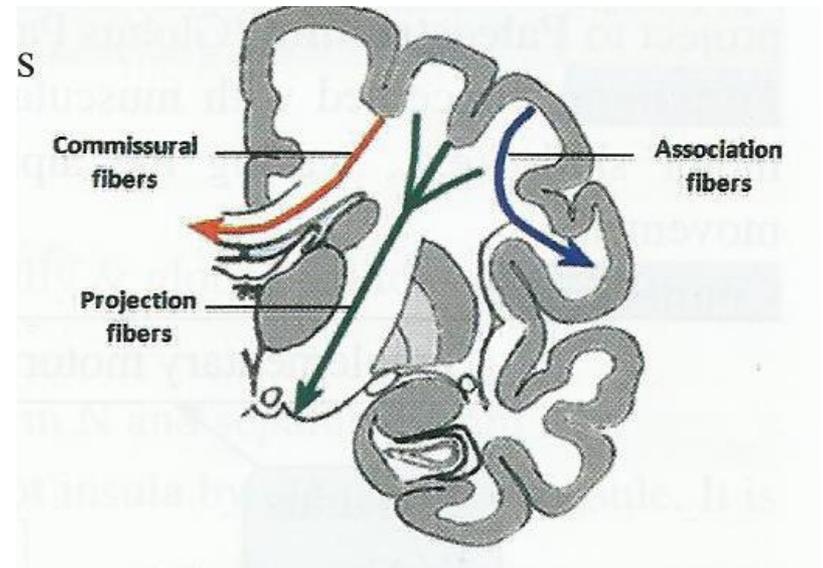
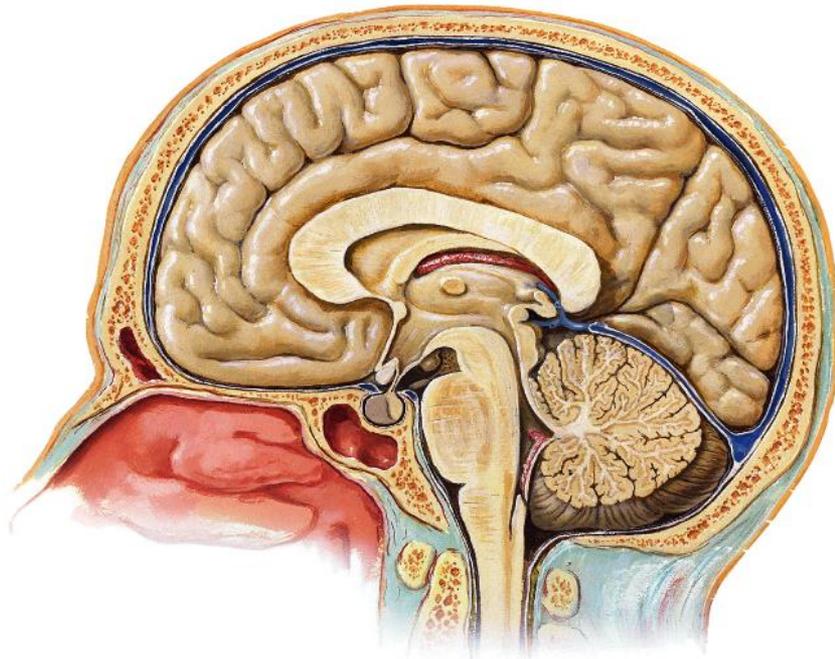
Lecture 12: White Matter of Cerebral Hemispheres

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WHITE MATTER OF CEREBRAL HEMISPHERES

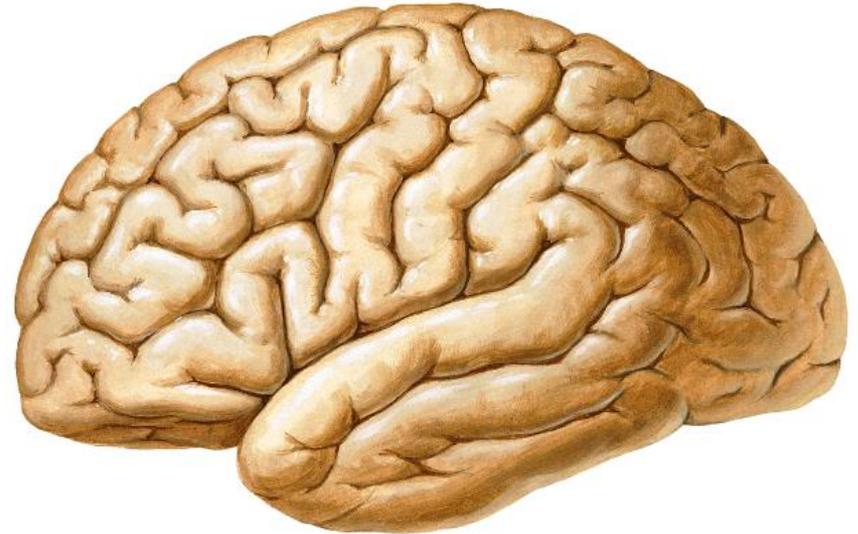
** 3 Types:

1. Association fibers.
2. Projection fibers.
3. Commissural fibers.



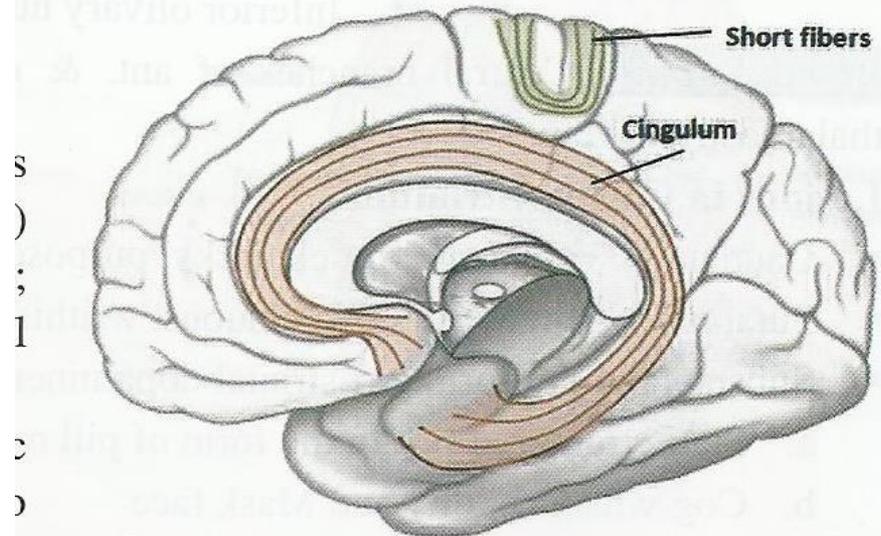
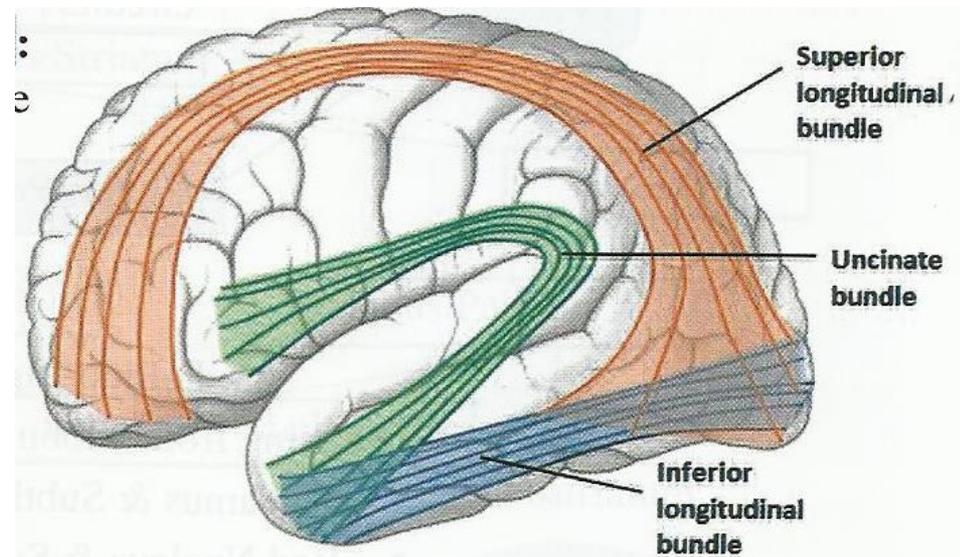
Association Fibers

- * Include fibers that connect different regions in the same hemisphere.
- * They are: either short or long.
 - A. Short fibers: connect adjacent gyri in the same lobe.
 - B. Long fibers: connect between lobes.



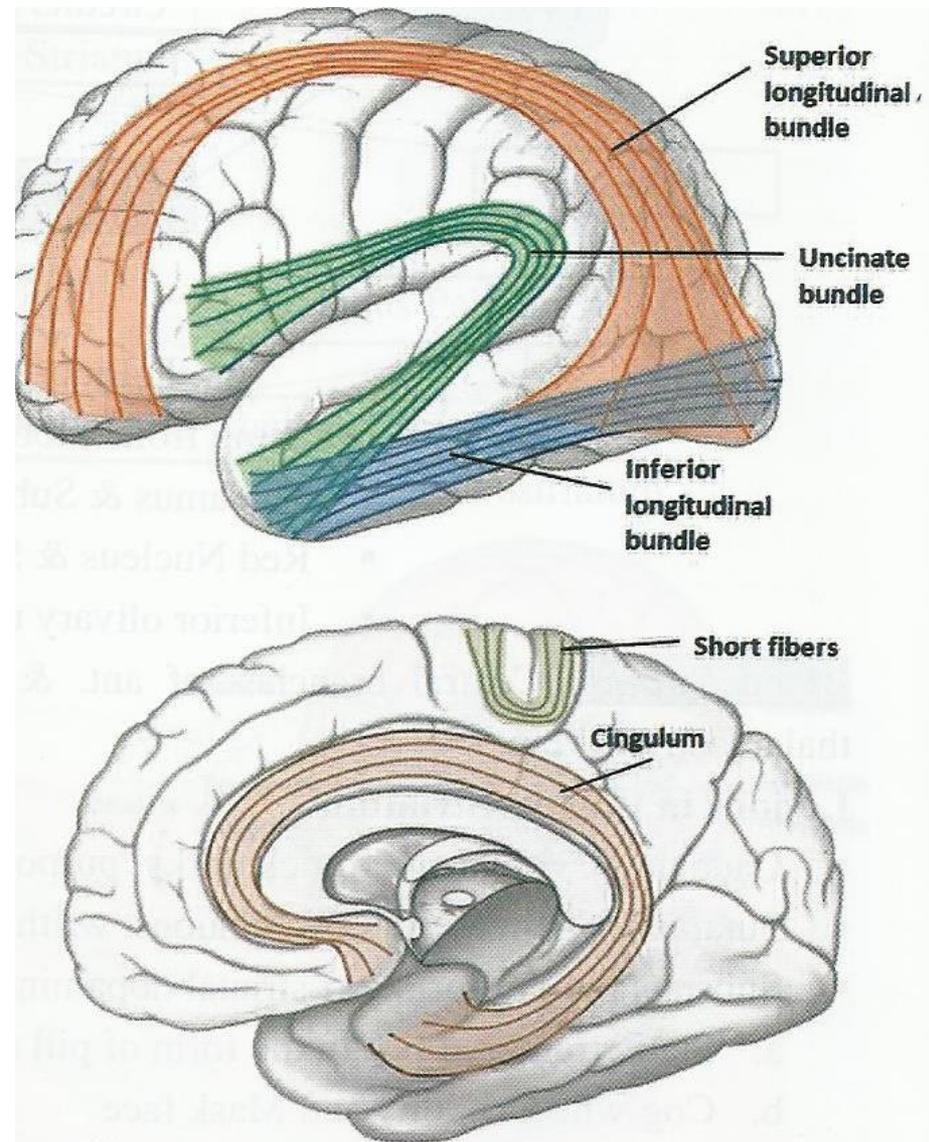
Association Fibers (contd)

- 1. Superior longitudinal bundle:** connects the frontal lobe to the occipital lobe and the temporal lobe.
- 2. Inferior longitudinal bundle:** connects the occipital lobe to the temporal lobe.
- 3. Fronto-occipital bundle:** connects the frontal lobe to the occipital and temporal lobes. It runs at a deeper plane than superior longitudinal bundle, and is considered as part of it separated from it by the fibers of the corona radiata.



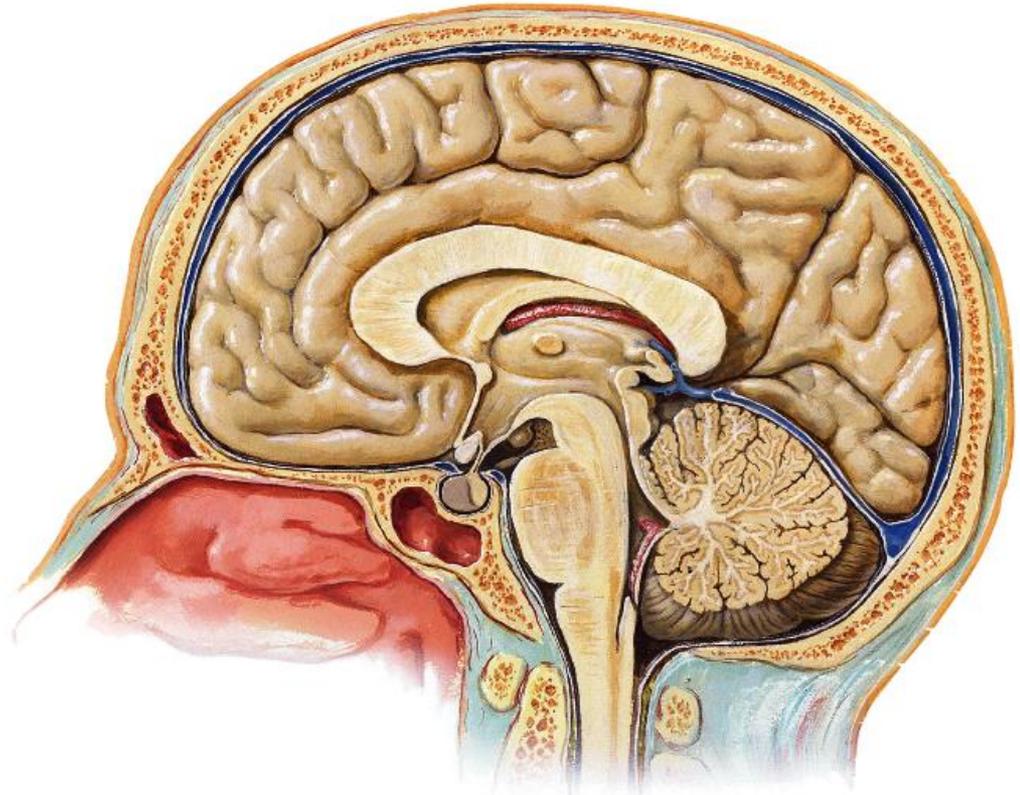
Association Fibers (contd)

4. Uncinate bundle: connects Wernicke's area (in the temporal lobe) to Broca's area (in the frontal lobe); forming an arch around the lateral sulcus.
5. Cingulum: runs deep to the limbic lobe & connects the cingulate gyrus to the parahippocampal gyrus.



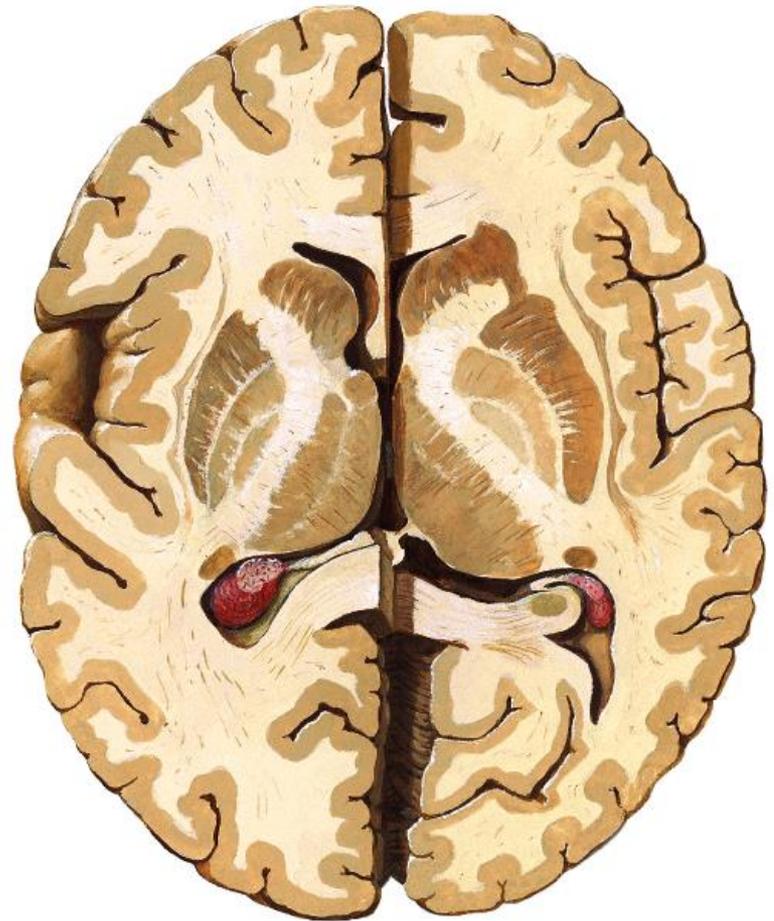
Projection Fibers

- ** Include fibers that connect the cerebral cortex with lower centers (diencephalon, brain stem and spinal cord).**
- ** It forms the corona radiata and internal capsule.**
- ** Its fibers are either ascending or descending.**



Internal Capsule

- ** A broad band of projection fibers running between three masses of grey matter: thalamus, caudate nucleus (medially) and lentiform nucleus (laterally).**
- ** It is V-shaped, having anterior limb, posterior limb, genu, retrolentiform part, and sublentiform part.**



Internal Capsule (contd)

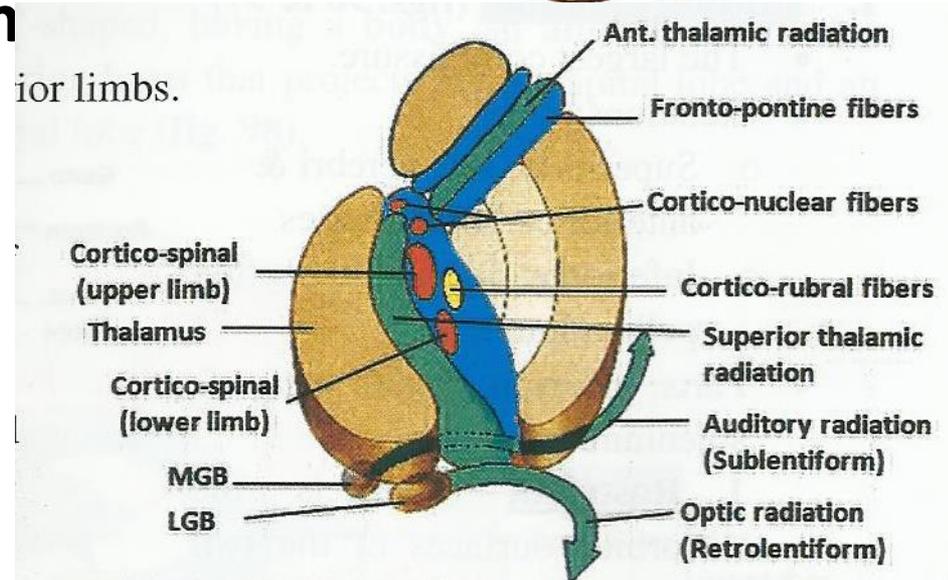
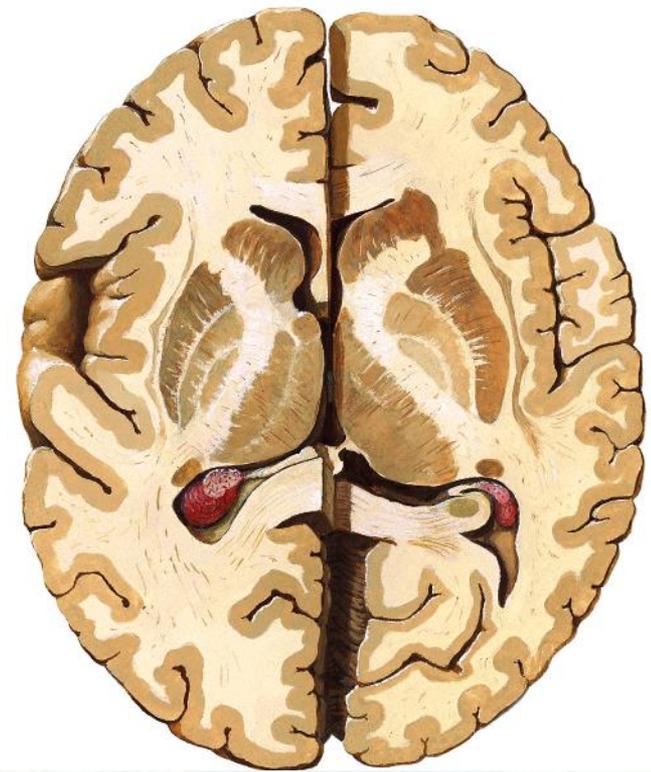
A. Anterior limb:

* Between head of caudate nucleus (medially) & lentiform nucleus (laterally).

* Contains:

1. **Frontopontine fibers:** from frontal cortex to pontine nuclei.

2. **Anterior Thalamic Radiation:** connects thalamic nuclei with frontal cortex.



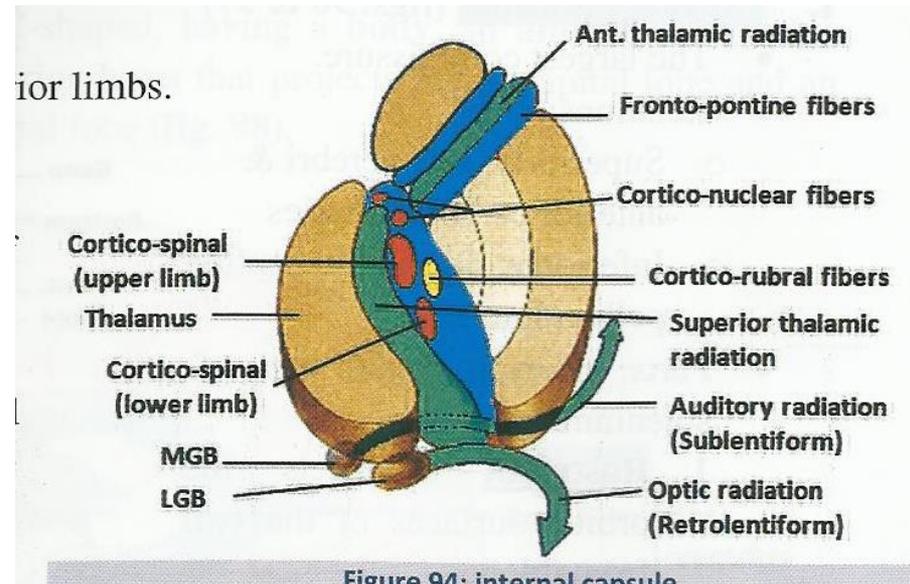
Internal Capsule (contd)

C. Posterior limb:

* Between thalamus (medially) and lentiform nucleus (laterally).

* Contains:

1. **Frontopontine fibers.**
2. **Corticospinal fibers:** fibers for upper limb lie anterior while fibers for lower limb lie posterior.
3. **Corticorubral fibers:** going to Red Nucleus of midbrain.
4. **Superior thalamic radiation (sensory radiation):** from VPLN & VPMN of thalamus to sensory cortex (SI & SII).



Internal Capsule (contd)

D. Retrolentiform part:

* Behind lentiform nucleus.

* Contains:

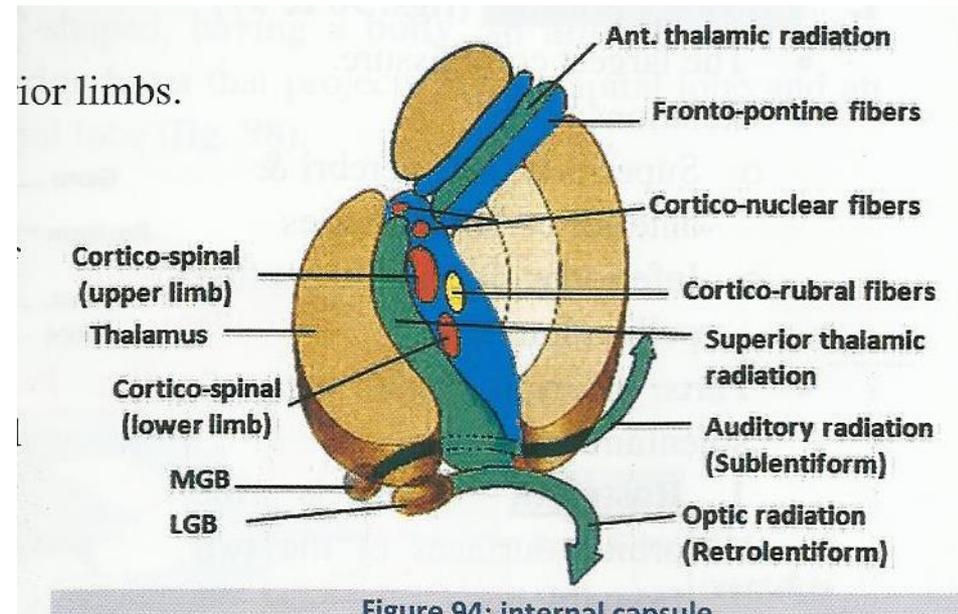
1. Optic radiation.
2. parietopontine and occipitopontine fibers.

E. Sublentiform part:

* Below lentiform Nucleus.

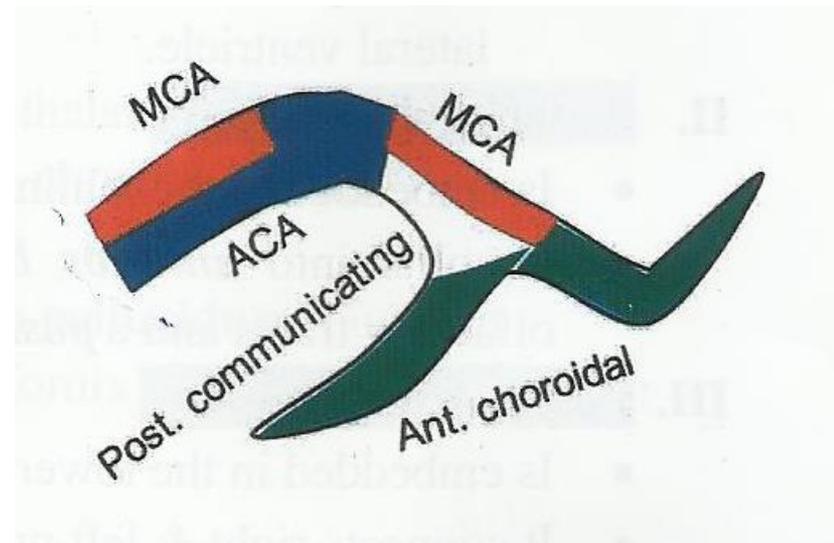
* Contains:

1. Auditory radiation.
2. Temporopontine and parietopontine fibers.



Blood supply of internal capsule

- * Upper 1/2 of ant. limb + upper 1/2 of post. limb → branches of **middle cerebral artery**.
- * Lower 1/2 of ant. limb + the genu → branches of **anterior cerebral artery**.
- * Lower 1/2 of post. limb → branches of **posterior communicating artery and anterior choroidal artery**.
- * Retrolentiform and sublenticular parts → branches of **anterior choroidal artery**.



Applied anatomy

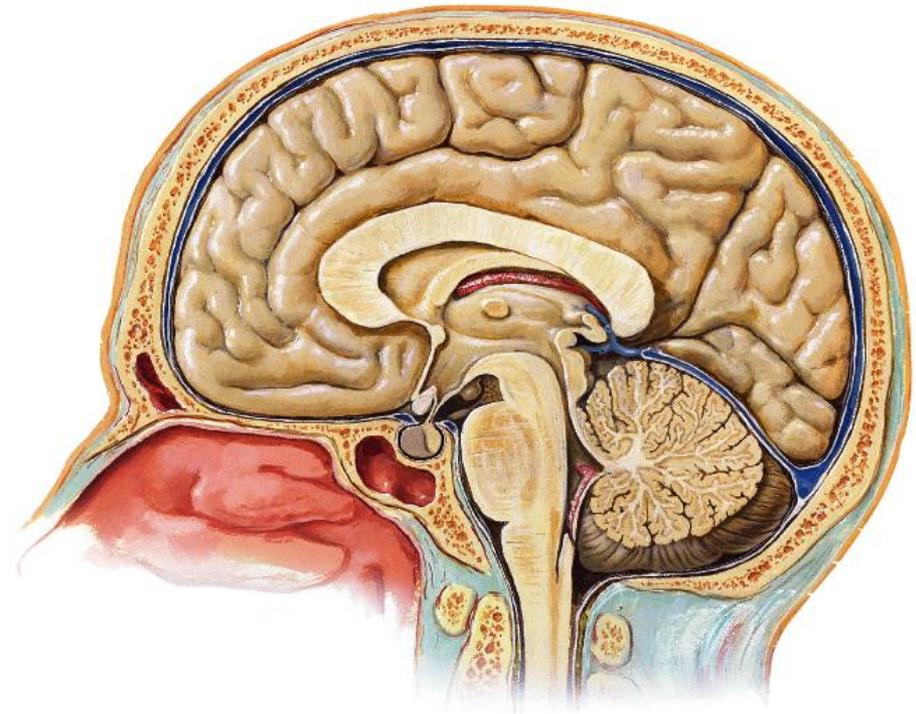
- ** The internal capsule is frequently involved in cerebrovascular accidents.**
- ** Because so many fibers are grouped in a small area, even a small hemorrhage can cause wide spread effects on the contralateral side of the body (total hemiplegia, hemianesthesia & UMN cranial nerve (VII, XII) affection).**

Commissural Fibers

** Include fibers that connect corresponding areas in Rt. & Lt hemispheres across the midline.

** They include:

1. Corpus callosum,
2. Ant. Commissure.
3. Post. Commissure.
4. Habenular commissure.
5. Hippocampal commissure.



I. Corpus Callosum:

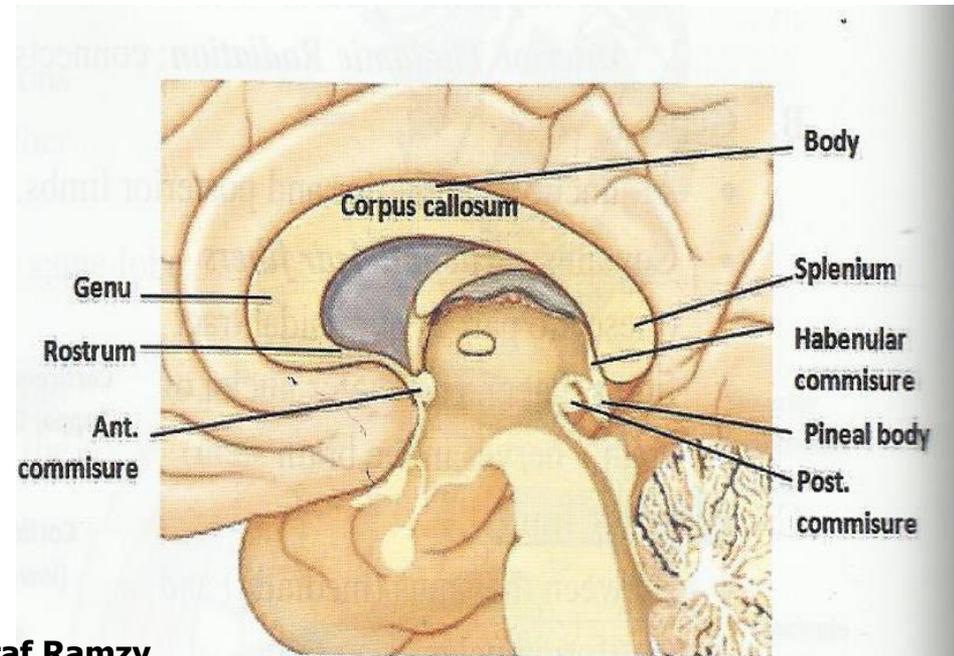
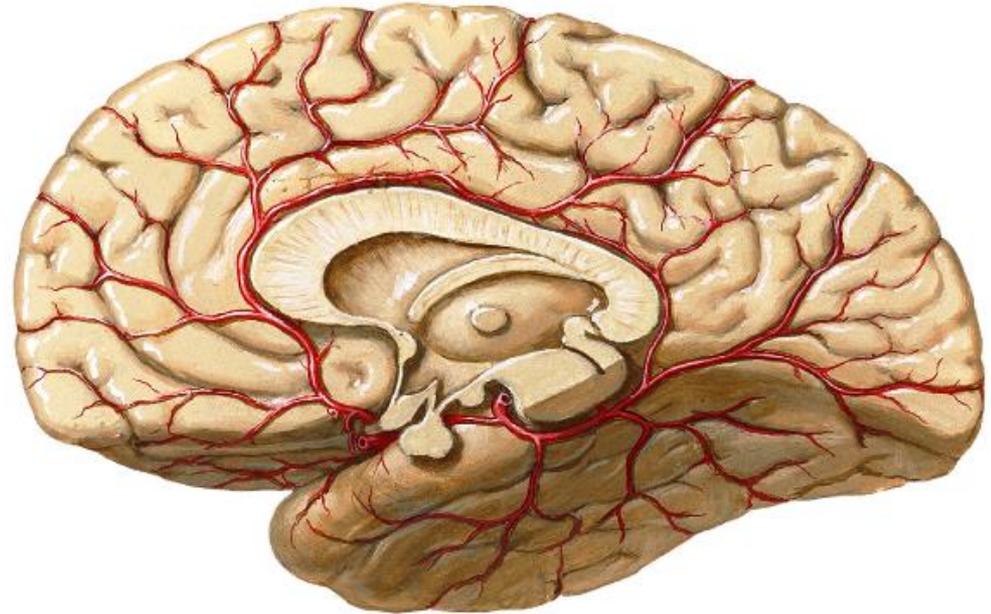
**** The largest commissure.**

**** Relations:**

*** Superiorly: falx cerebri & anterior cerebral arteries.**

*** Inferiorly: fornix & septum pellucidum**

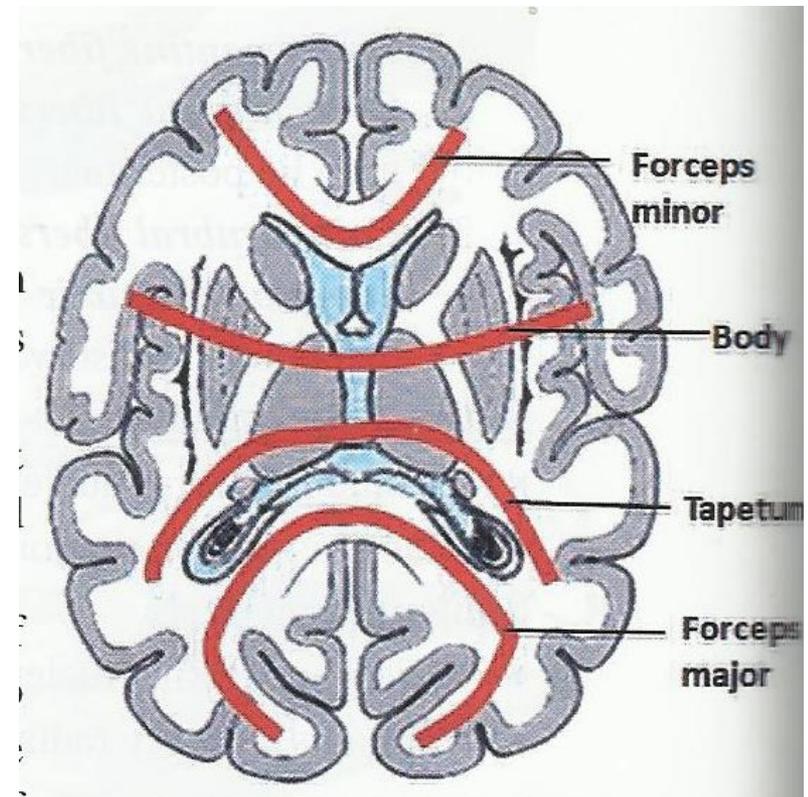
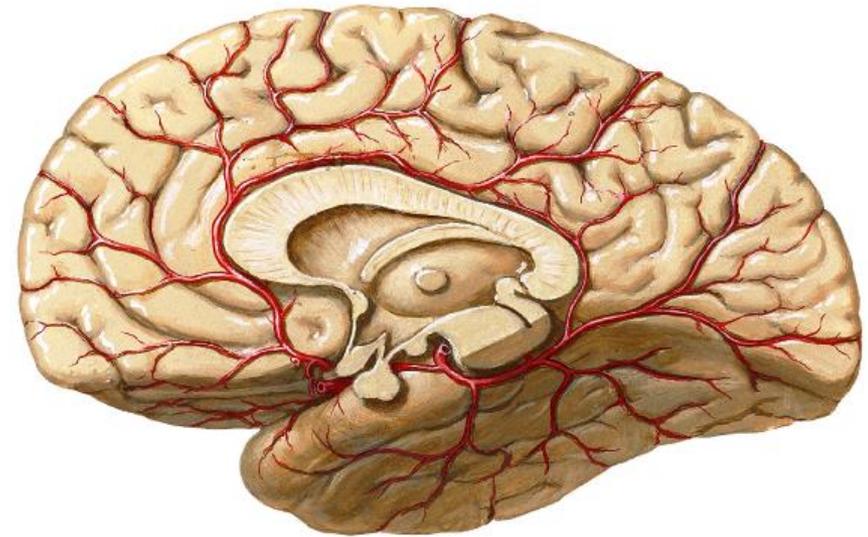
**** Parts: rostrum, genu, body & splenium.**



1. **Rostrum**: Connects the orbital surfaces of the two frontal lobes.

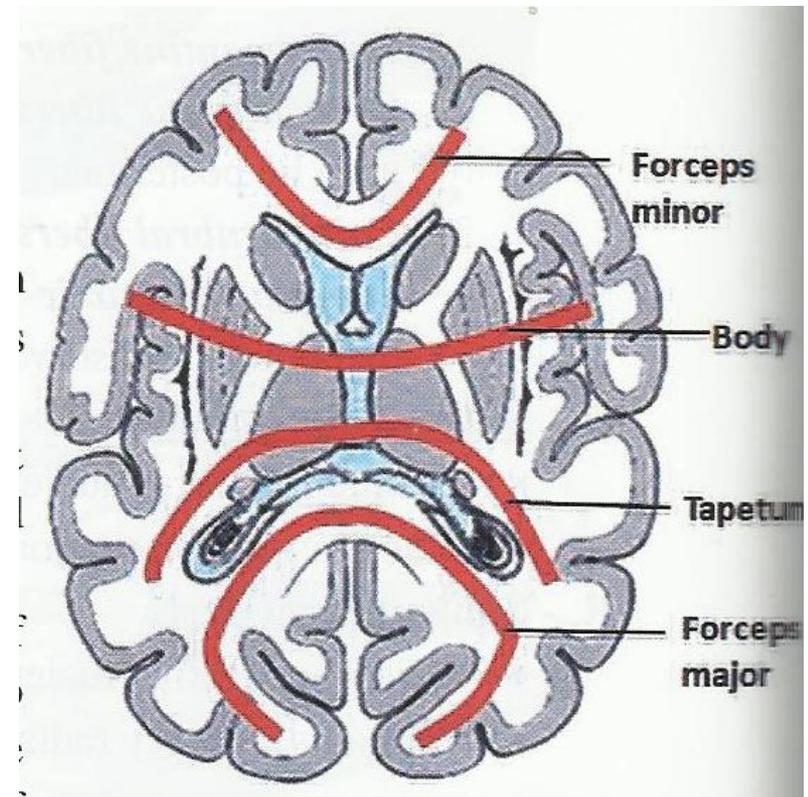
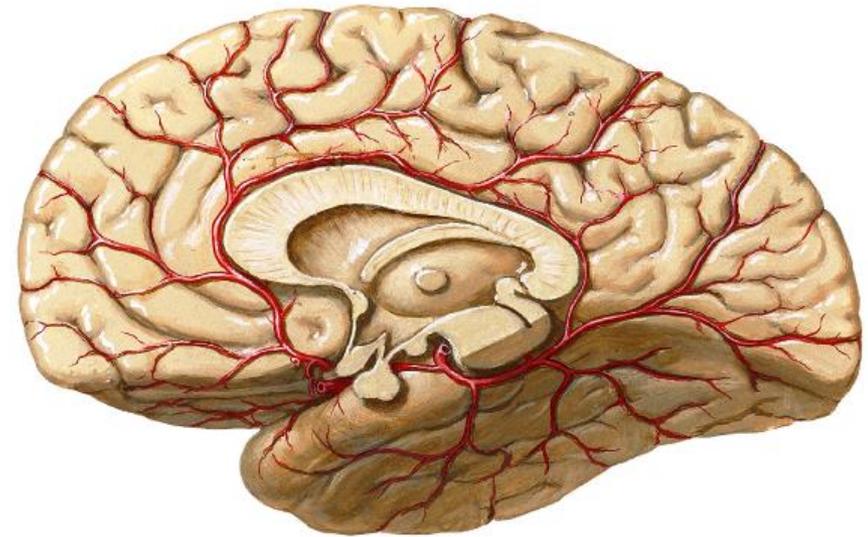
2. **Genu**: Connect the medial & lateral surfaces of the two frontal lobes. Its fibers form the **forceps minor**.

3. **Body (Trunk)**: Connects wide areas of cortex in parietal, temporal and occipital lobes. Its fibers intersect with the corona radiata



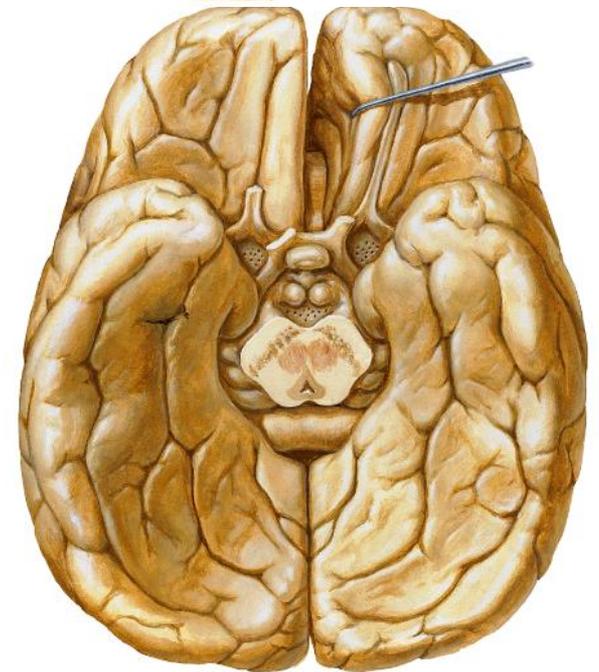
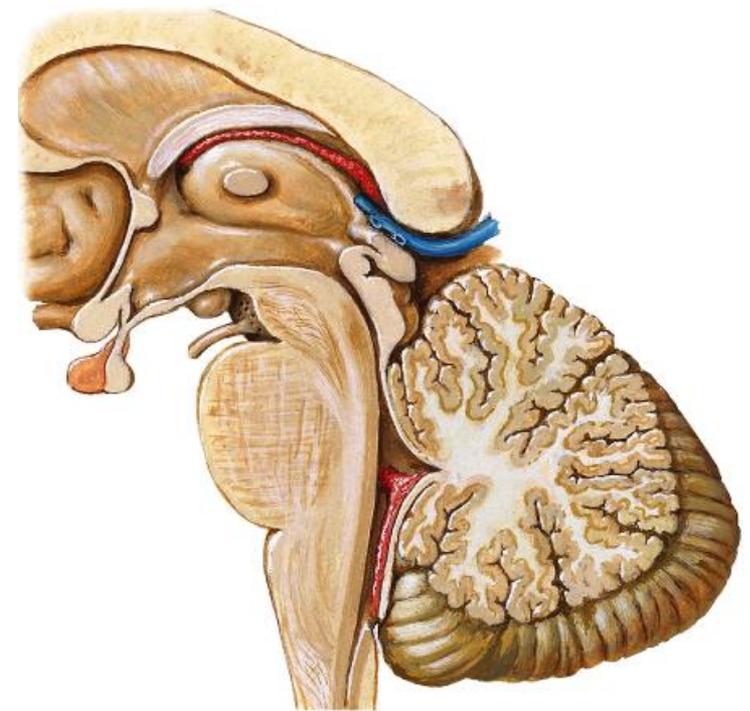
4. **Tapetum**: fibers from posterior part of body & anterior part of splenium that form roof and lateral wall of post horn of lateral ventricle.

5. **Splenium**: It is the expanded posterior part of corpus callosum. Its fibers curve back into occipital lobes forming **forceps major**. These fibers produce a bulb in the posterior horn of lateral ventricle.



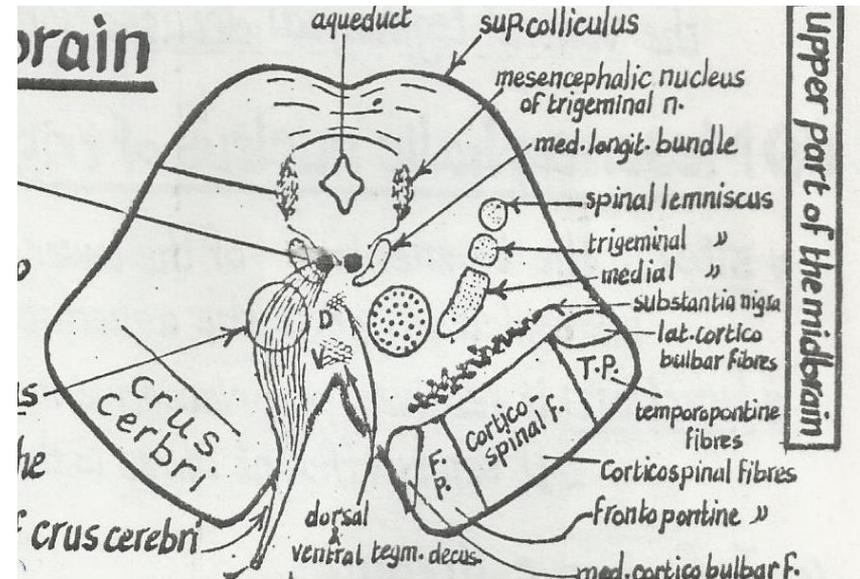
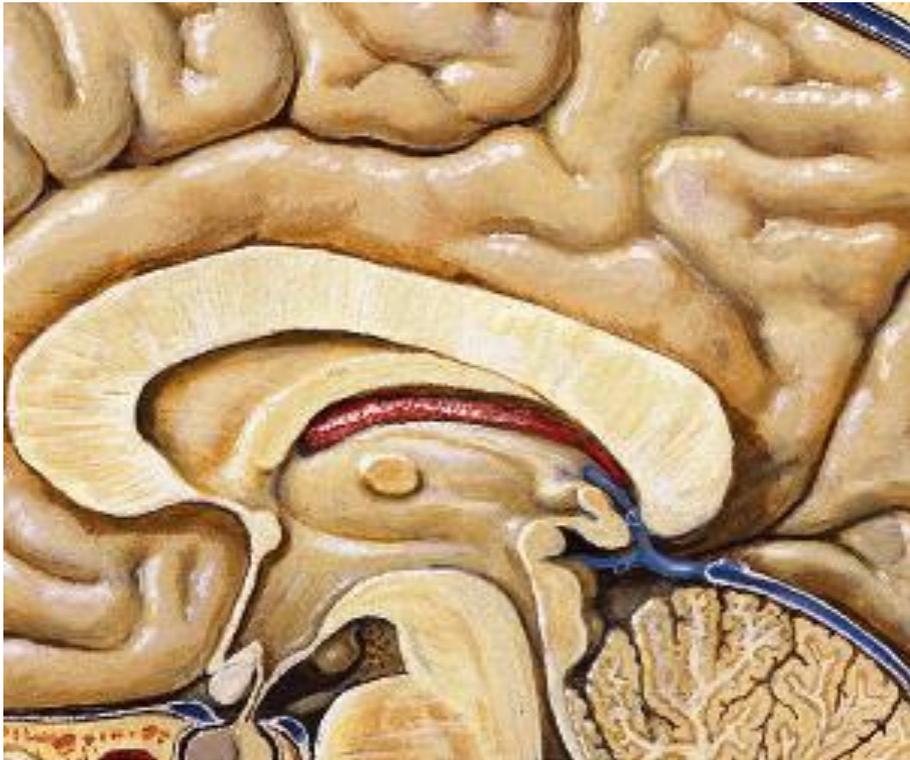
II. Anterior commissure:

- * Is embedded in the lamina terminalis, anterior to the column of fornix.**
- * It splits into anterior bundle that connects anterior perforated substances and olfactory tracts and a posterior bundle that connect temporal gyri.**



III. Posterior commissure:

- * Is embedded in the lower lamina of the pineal stalk.
- * It connects right & left pretectal nuclei, superior colliculi & MLB.

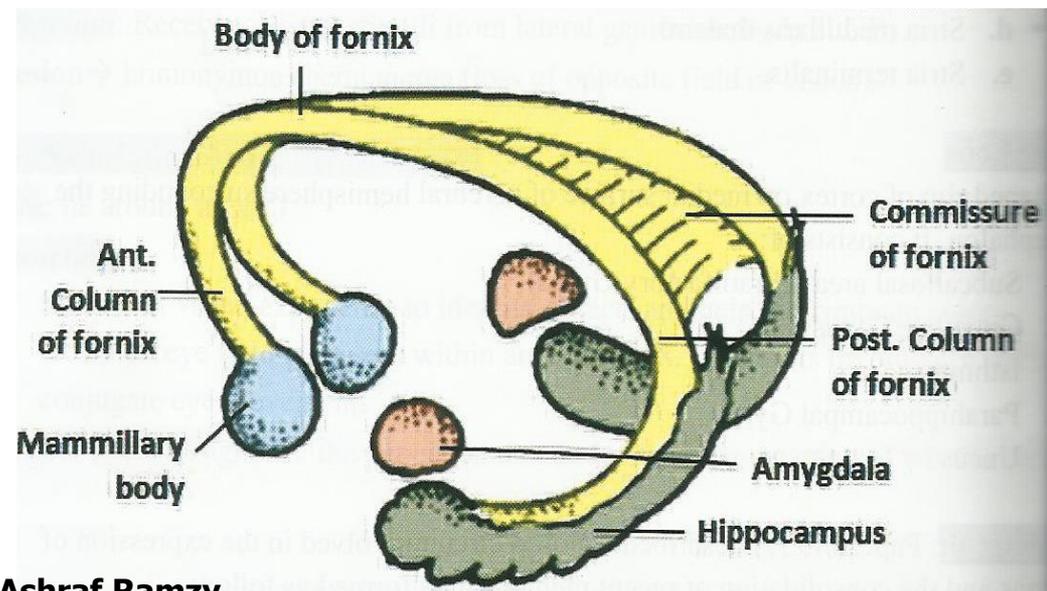
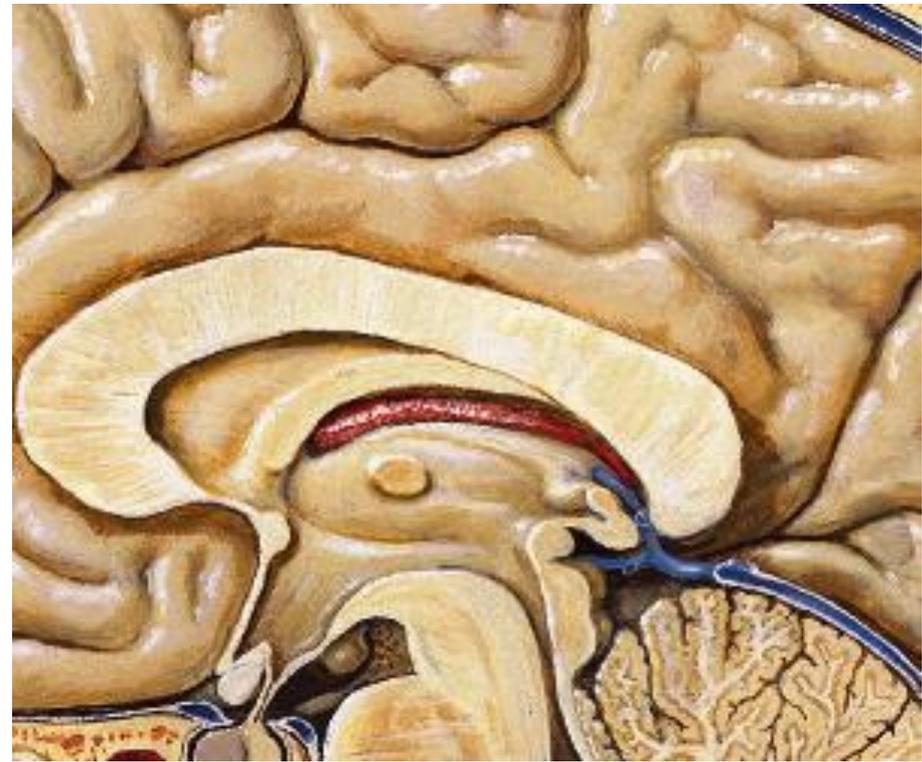


IV. Habenular commissure:

- * Is embedded in the upper lamina of the pineal stalk.**
- * Connects the right & left habenular nuclei.**

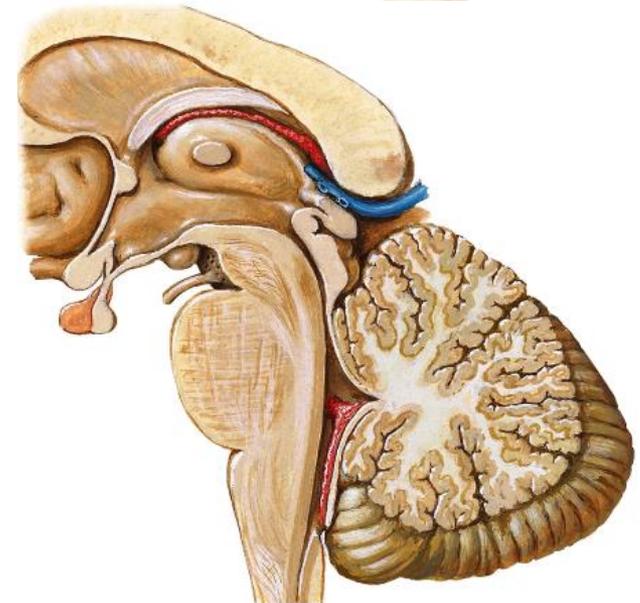
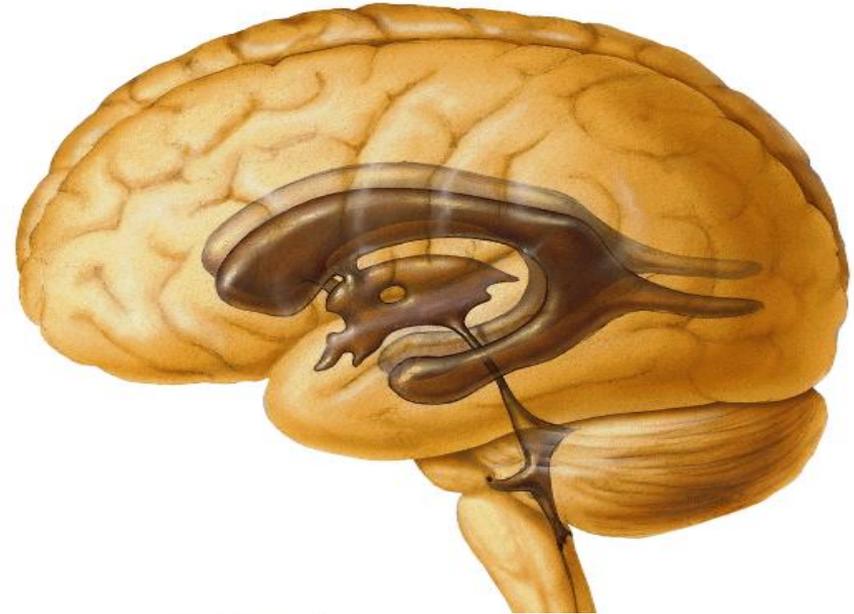
V. Hippocampal commissure or commissure of the fornix:

- * Connects the posterior columns (Crura) of fornix, thus connect right and left hippocampus.**



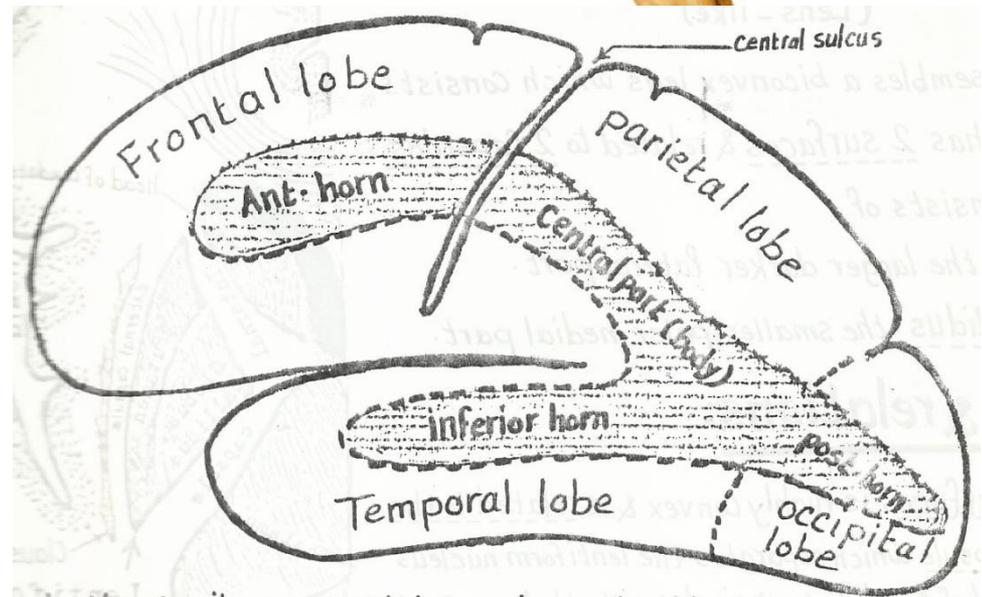
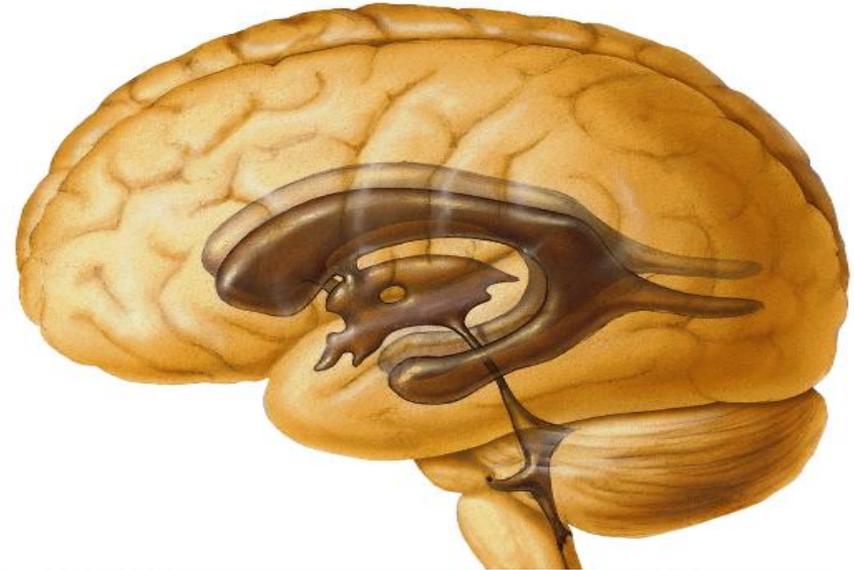
LATERAL VENTRICLE

- ** It is the largest brain ventricle.**
- ** The right and left lateral ventricles are the cavities of the cerebral hemispheres (telencephalon).**
- ** It is connected with the 3rd ventricle by the interventricular foramen (of Monro) which is bounded anteriorly by the anterior column of the fornix and posteriorly by the anterior end of the thalamus.**



LATERAL VENTRICLE

**** Each lateral ventricle is a roughly C-shaped, having a body, an anterior horn that projects into the frontal lobe, a posterior horn that projects into occipital lobe and an inferior horn that extends into temporal lobe.**



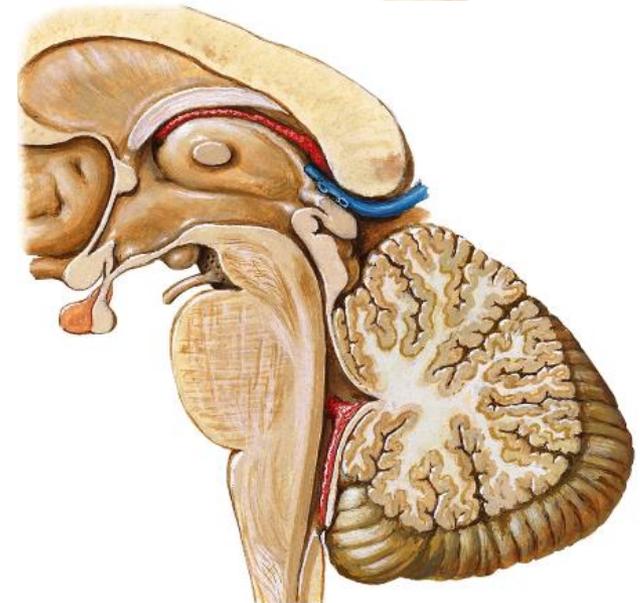
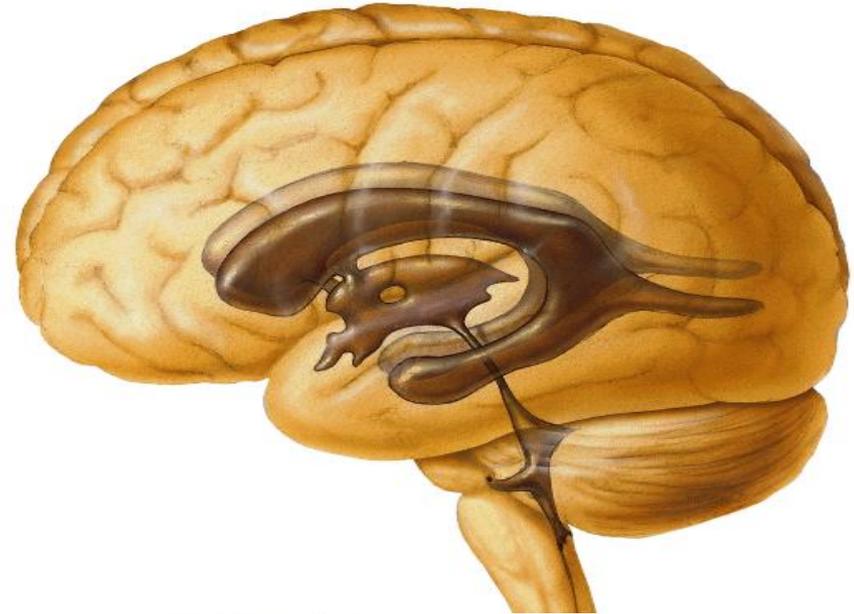
LATERAL VENTRICLE

I. The body:

- * Extends from the interventricular foramen till the posterior end of the thalamus, where it becomes continuous with the posterior and the inferior horns.

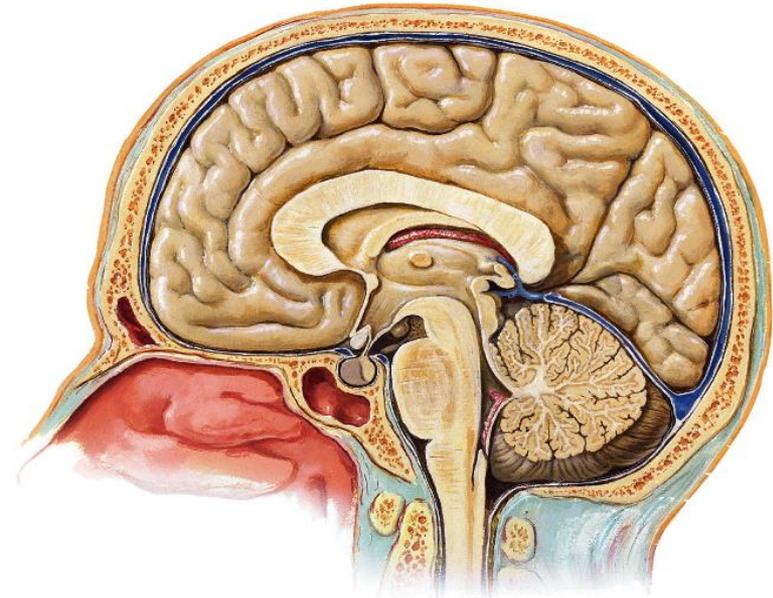
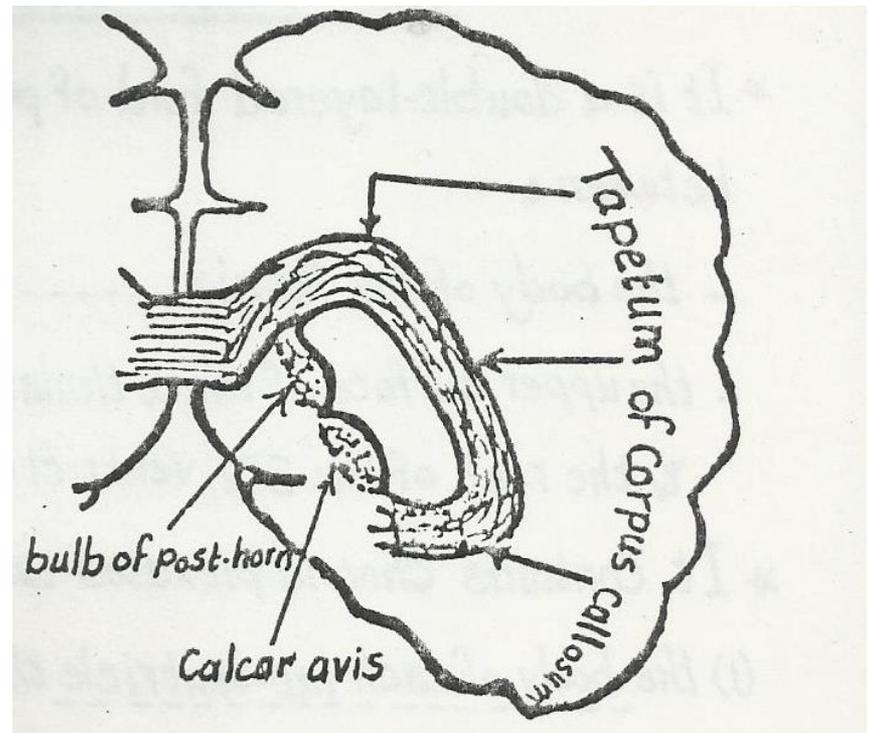
II. The anterior horn:

- * Extends forward into the frontal lobe. It is continuous posteriorly with the body of the ventricle at the interventricular foramen.



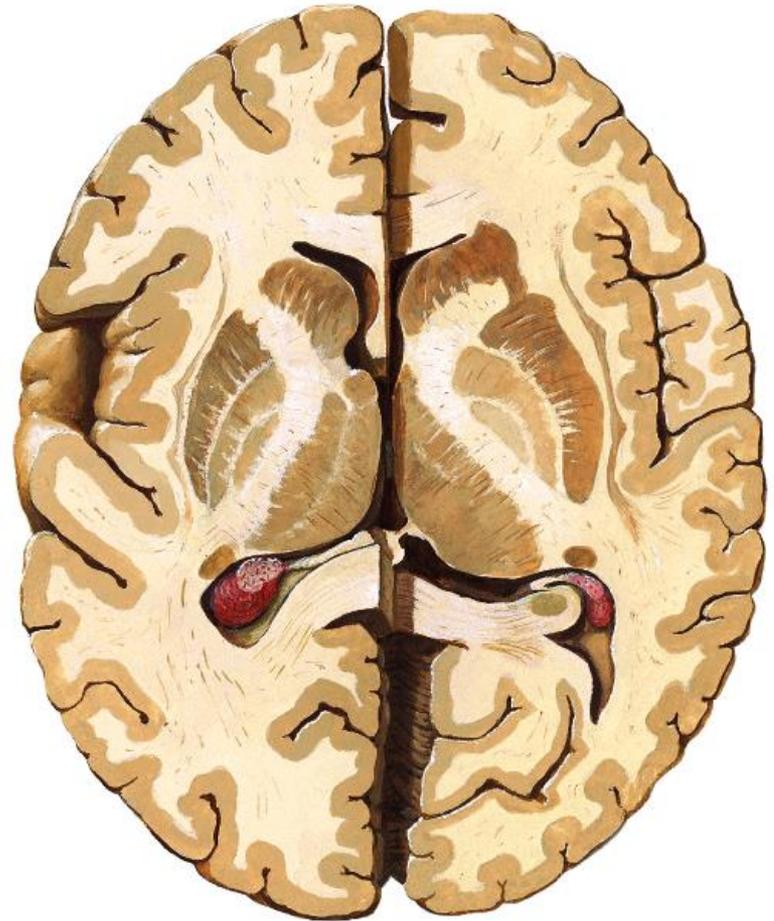
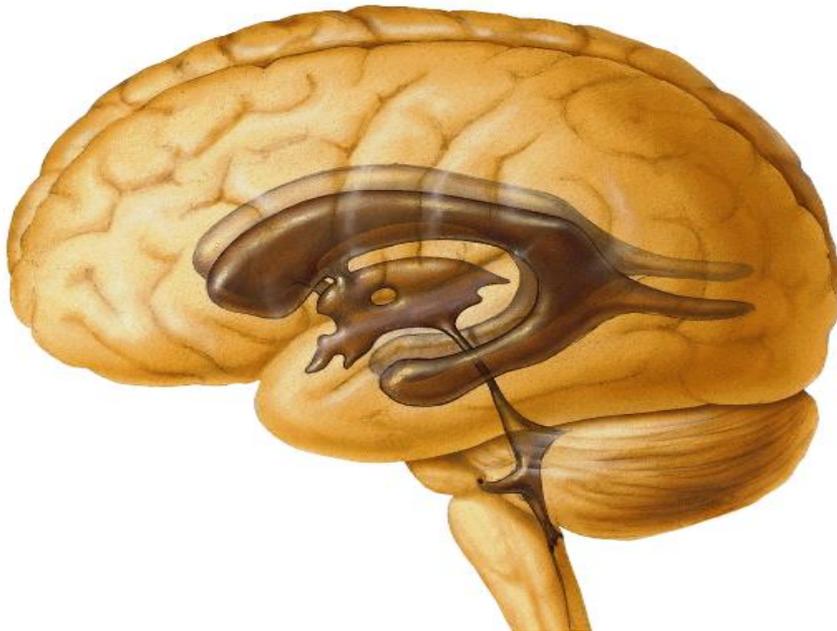
III. The posterior horn:

- * Extends posteriorly into the occipital lobe.
- * Boundaries:
- * The roof and lateral walls: are formed by the fibers of the tapetum of the corpus callosum. Lateral to it is the optic radiation then the inferior longitudinal bundle(TOI).
- * The medial wall has two elevations:
 1. Bulb of posterior horn (above): made by fibers of the forceps major.
 2. Calcar avis (below): made by the calcarine sulcus.



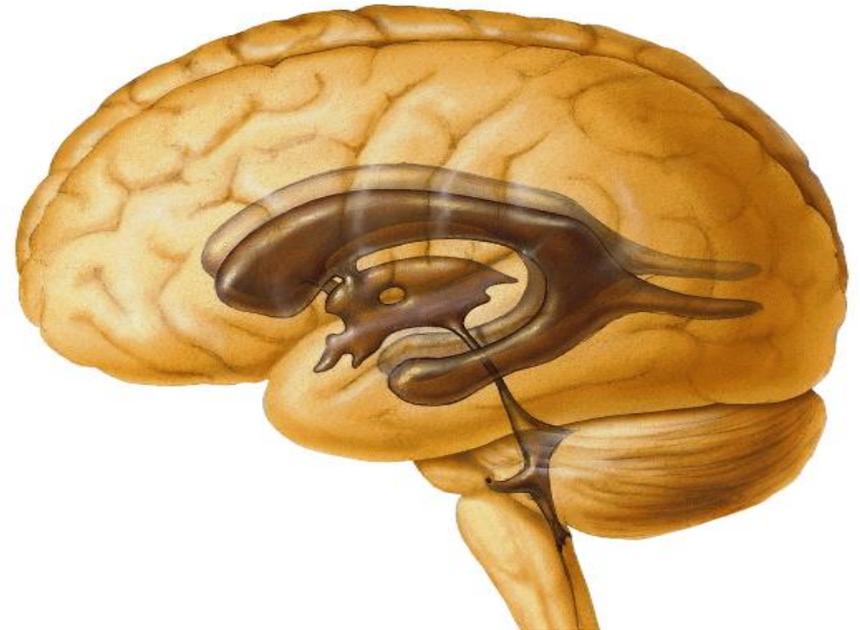
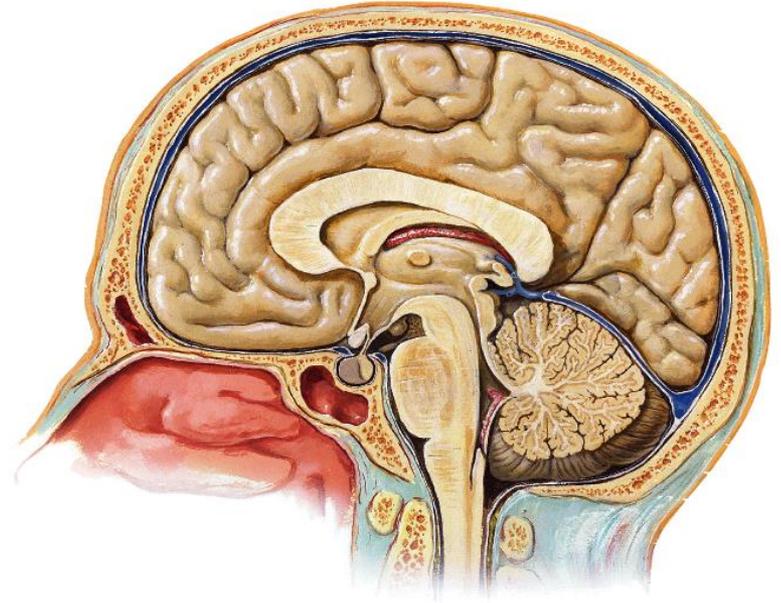
IV. The inferior horn:

- * Extends anteriorly into the temporal lobe.**
- * Boundaries: it has a roof and a floor.**



Choroid fissure

- * A slit-like gap in the medial wall of the body and inferior horn, through which the choroid plexus projects into the ventricle.
- * The part of the fissure in the body of lateral ventricle lies between the body of the fornix and the upper surface of the thalamus.
- * The part of the fissure in the inferior horn of lateral ventricle lies in the interval between the stria terminalis and the fimbria.

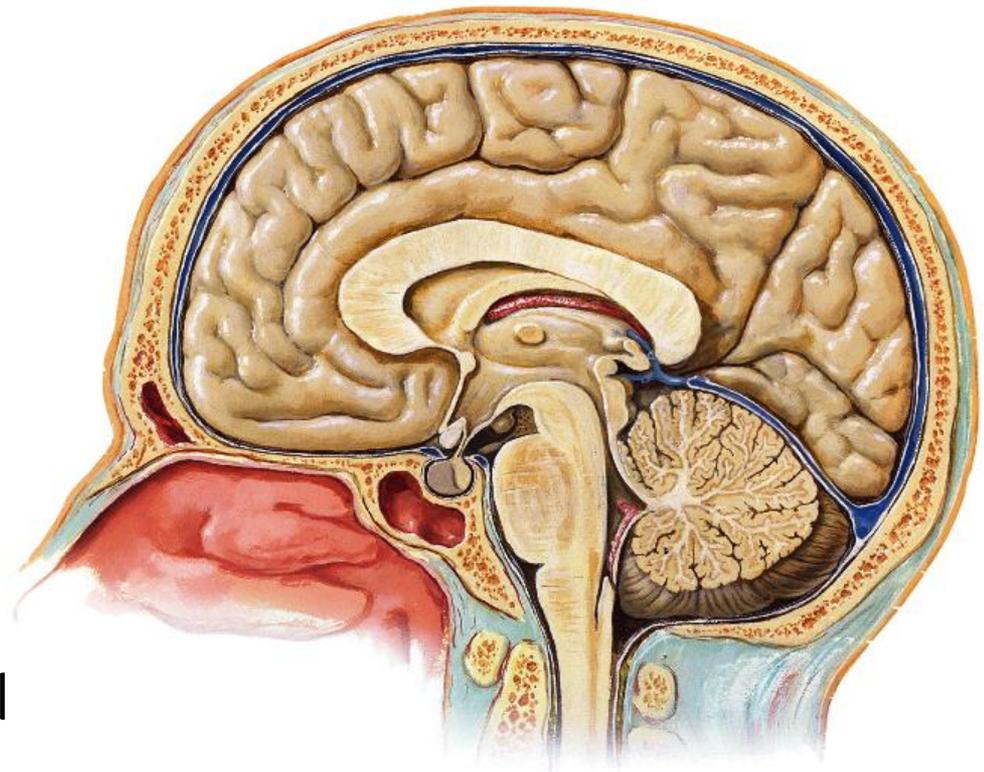


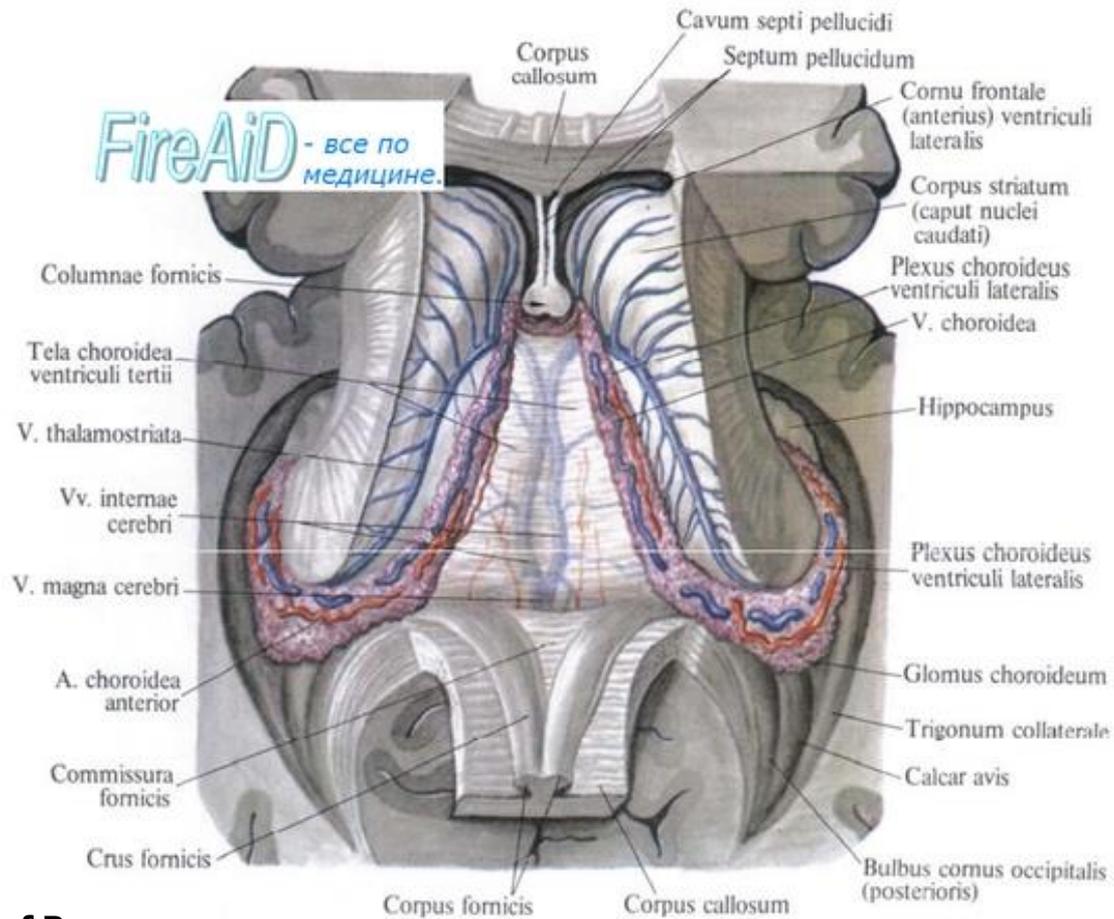
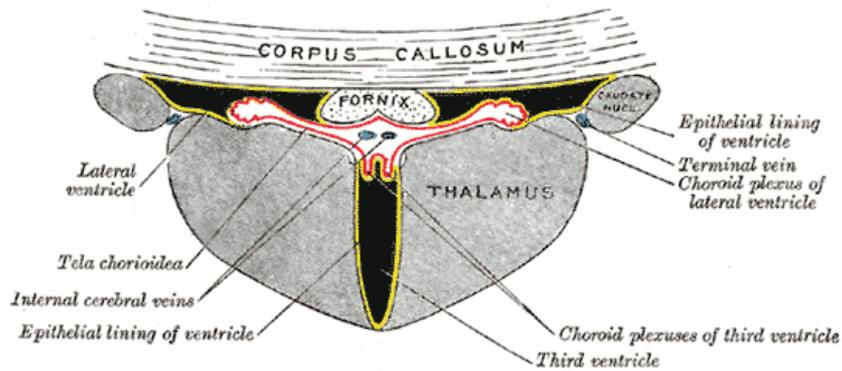
Tela choroidea

**** A two-layered fold of pia mater that lies above the roof of 3rd ventricle & carries blood vessels to the 3rd and lateral ventricles.**

**** These vessels are:**

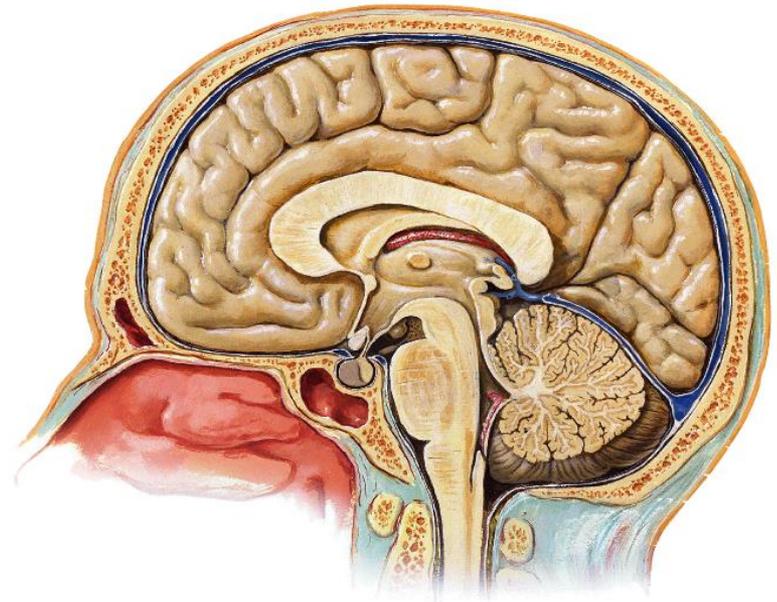
- 1. Arteries: ant. choroidal (of internal carotid) & post. choroidal (of posterior cerebral).**
- 2. Veins: a plexus → choroidal vein → internal cerebral vein.**





Tela choroidea (contd)

- ** It is triangular in shape.
- * Posteriorly: its base lies at the transverse cerebral fissure below the splenium of corpus callosum.
- * Anteriorly: its apex reaches till the interventricular foramen of Monro
- * Laterally: its edges invaginate the choroid fissure, pushing its ependymal lining, to form its choroid plexus of lateral ventricle.
- * Inferiorly: it invaginates the roof of third ventricle, pushing its ependymal lining, to form its choroid plexus one on each side of midline.
- * N.B: *Tela choroidea = pia + bl. vessels.
- * Chroid plexus = pia + bl.vessels. + ependyma.



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