VENTRICULAR SYSTEM

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Case Presentation

- A 26-year-old woman involved in an automobile accident was admitted to the emergency department.
- Her mother, who was also in the car, told the physician that at the time of impact, her daughter's head was thrown forward against the windshield.
- On examination, the patient was unconscious and showed evidence of a severe head injury on the left side.
- After a thorough physical examination, the physician decided to perform a spinal tap.
- The specimens showed red blood cells at the bottom of the tubes, and the supernatant fluid was blood stained.
- After standing for an hour, the supernatant fluid in both tubes became colorless.

Case Presentation

- The physician made the diagnosis of subarachnoid hemorrhage secondary to the head injury.

- The blood could have originated from a severe fracture of the skull, damage to one of the cerebral blood vessels, or a tear involving the brain or covering meninges.

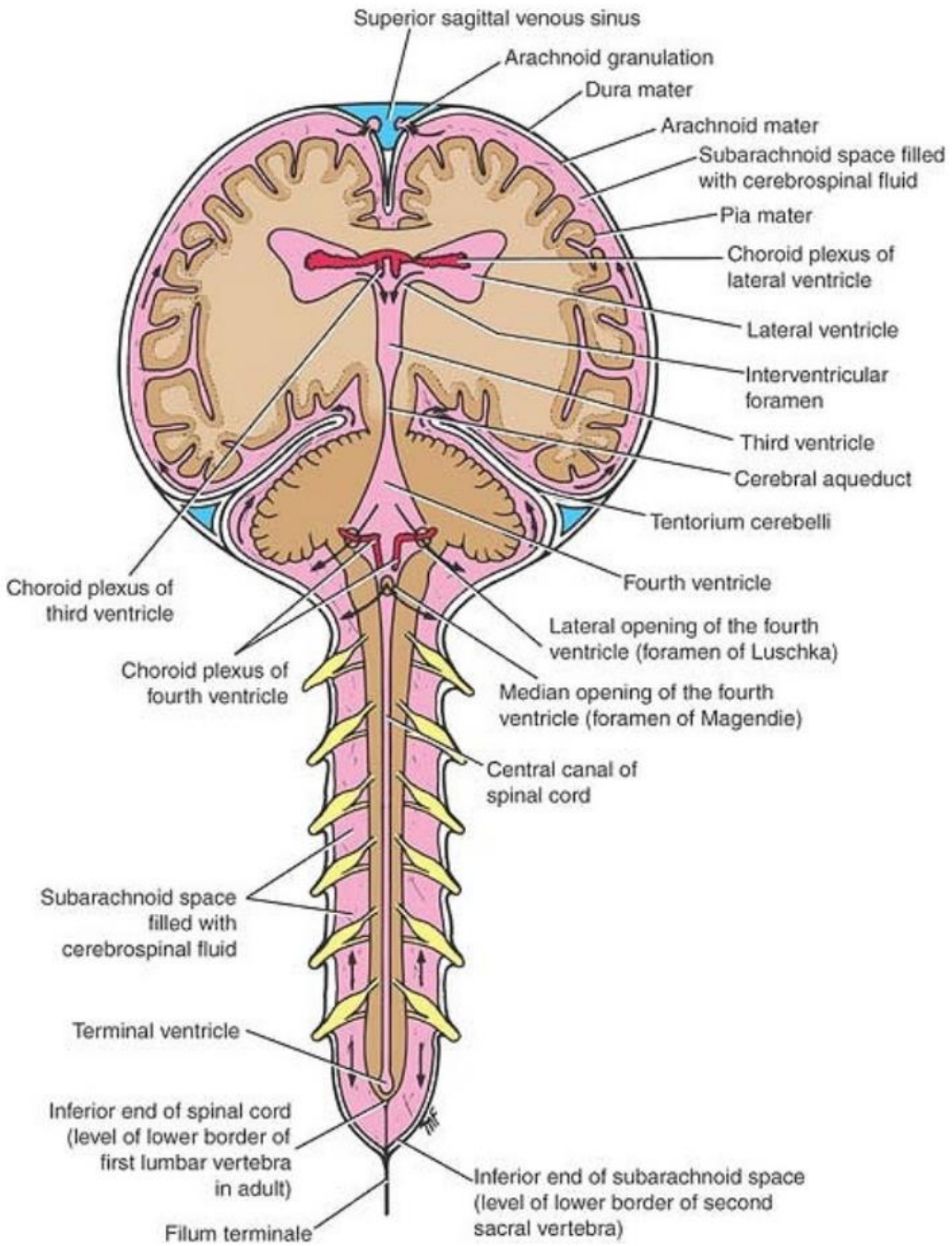
Ventricular System

Ventricles are four fluid-filled cavities located within the brain

The two lateral ventricles, the third ventricle, and the fourth ventricle .

The two lateral ventricles communicate through the interventricular foramina (of Monro) with the third ventricle.

The third ventricle is connected to the fourth ventricle by the narrow cerebral aqueduct (aqueduct of Sylvius).



Ventricular System

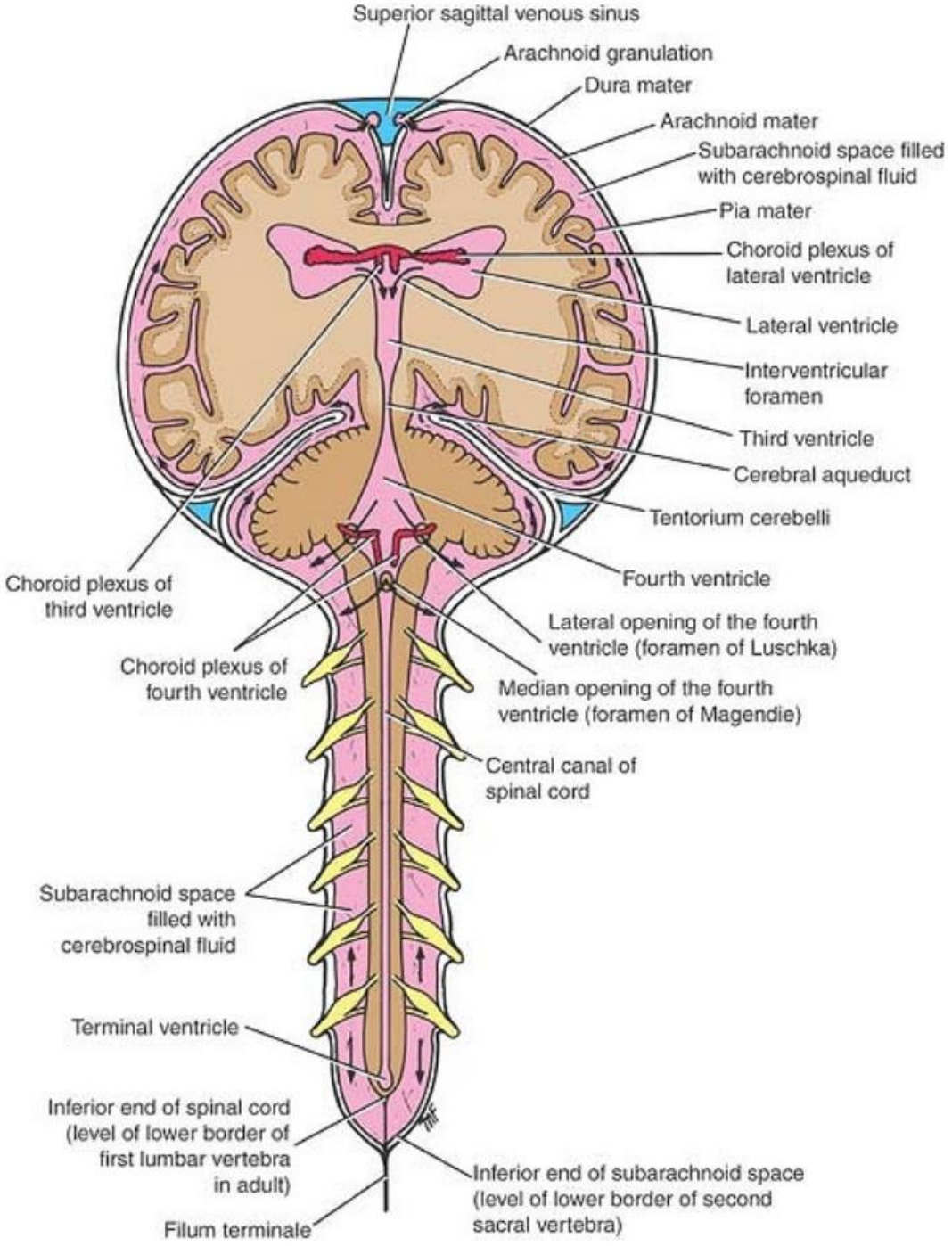
The fourth ventricle, in turn, is continuous with the narrow central canal of the spinal cord

And, through the three foramina in its roof, with the subarachnoid space.

The central canal in the spinal cord has a small dilatation at its inferior end, referred to as the terminal ventricle .

The ventricles are lined throughout with ependyma and are filled with cerebrospinal fluid.

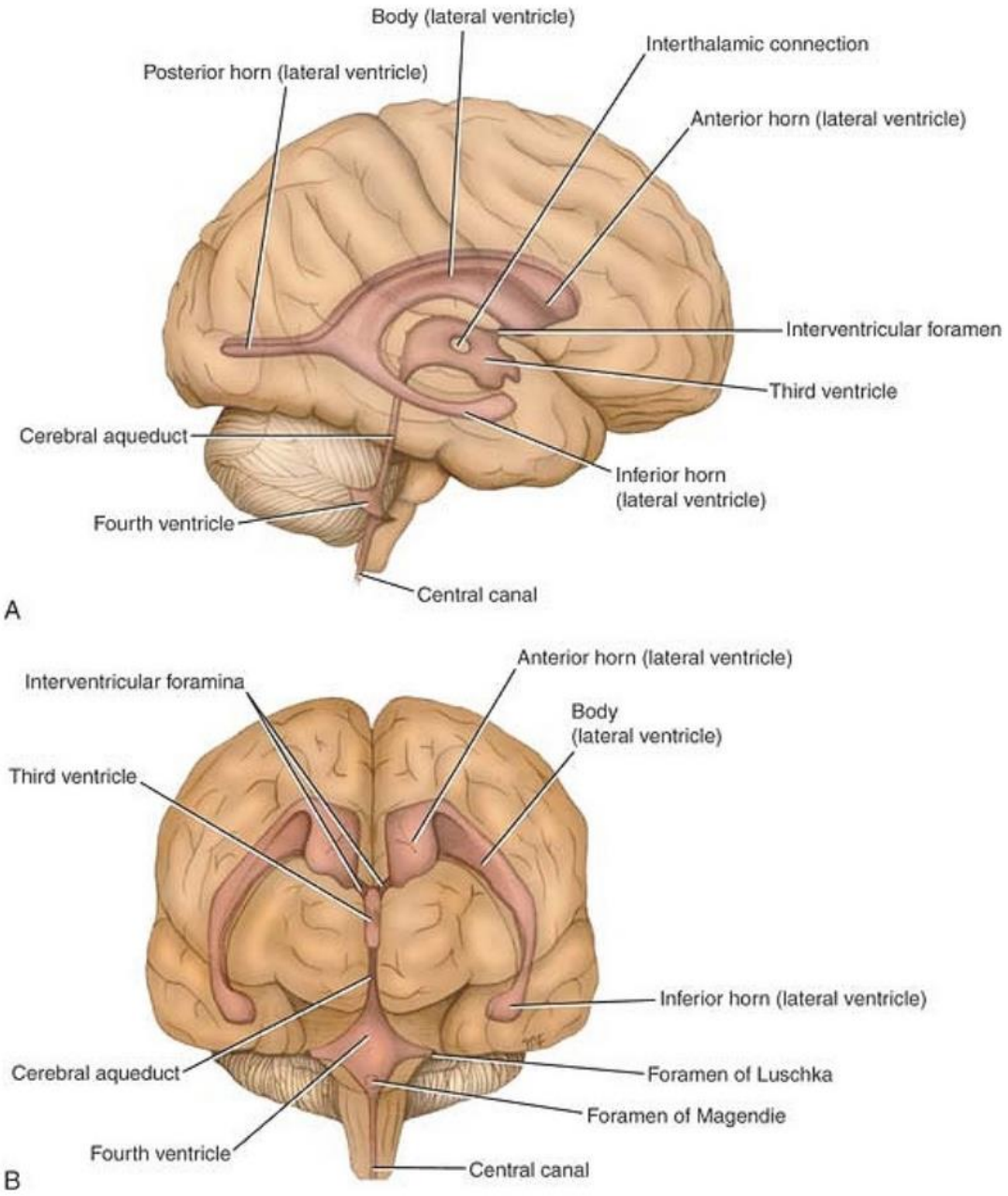
The ventricles are developmentally derived from the cavity of the neural tube.



Lateral Ventricles

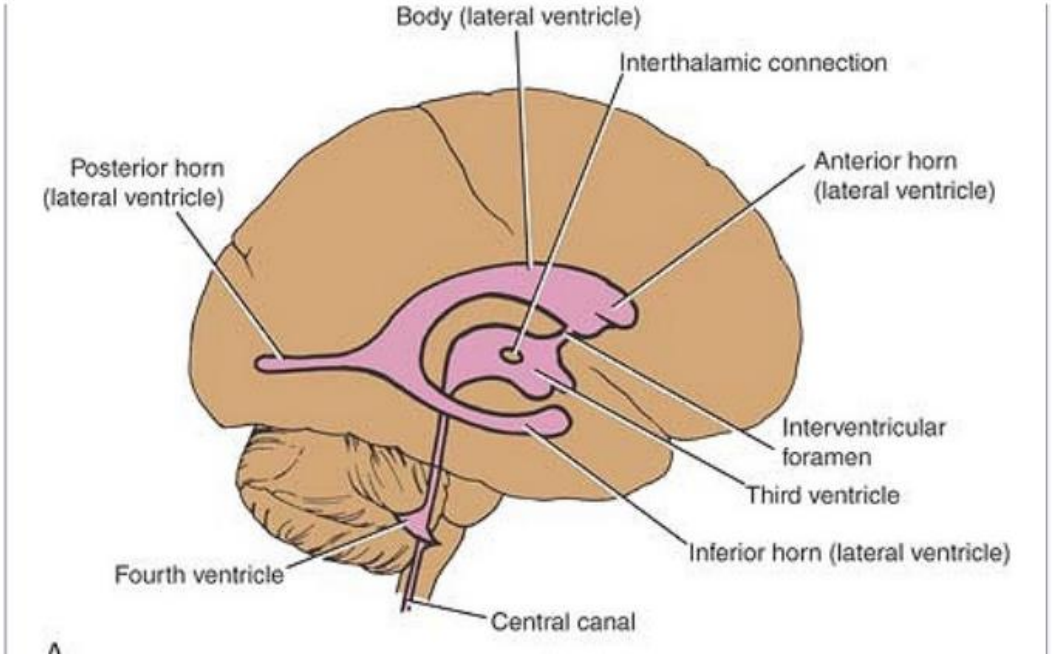
Two large lateral ventricles

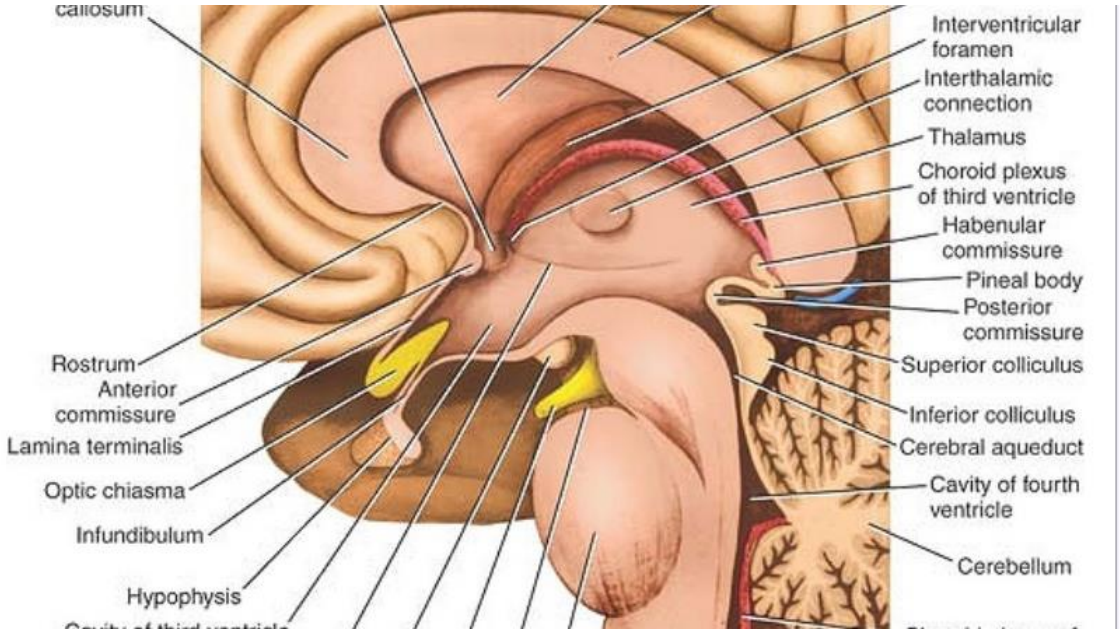
- Each is present in each cerebral hemisphere.
- The ventricle is a roughly C-shaped cavity
- And may be divided into a body, which occupies the parietal lobe
- And from which anterior, posterior, and inferior horns extend into the frontal, occipital, and temporal lobes, respectively.



Lateral Ventricles

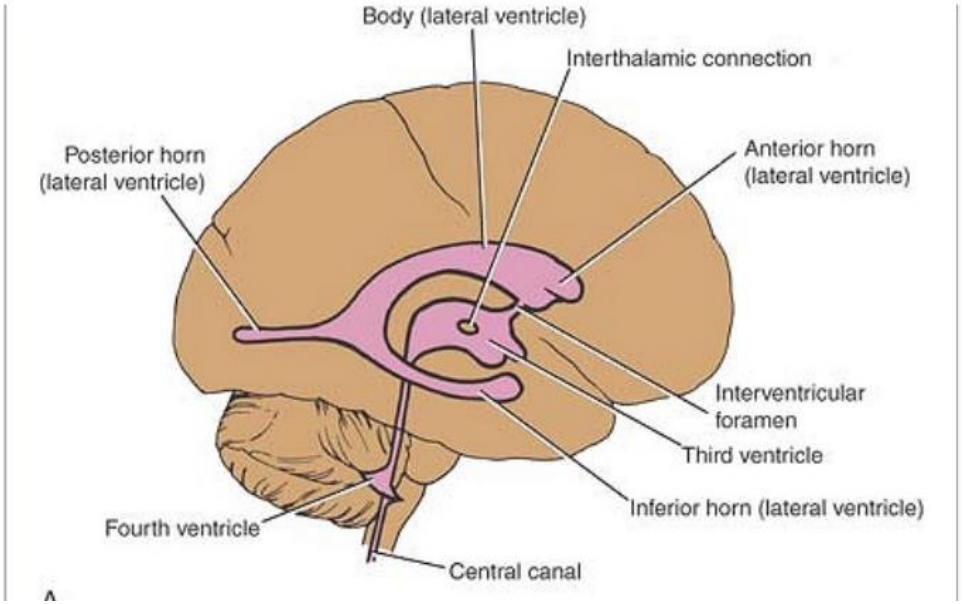
- The lateral ventricle communicates with the cavity of the third ventricle through the interventricular foramen .
- This opening, which lies in the anterior part of the medial wall of the ventricle, is bounded anteriorly by the anterior column of the fornix
- And posteriorly by the anterior end of the thalamus.

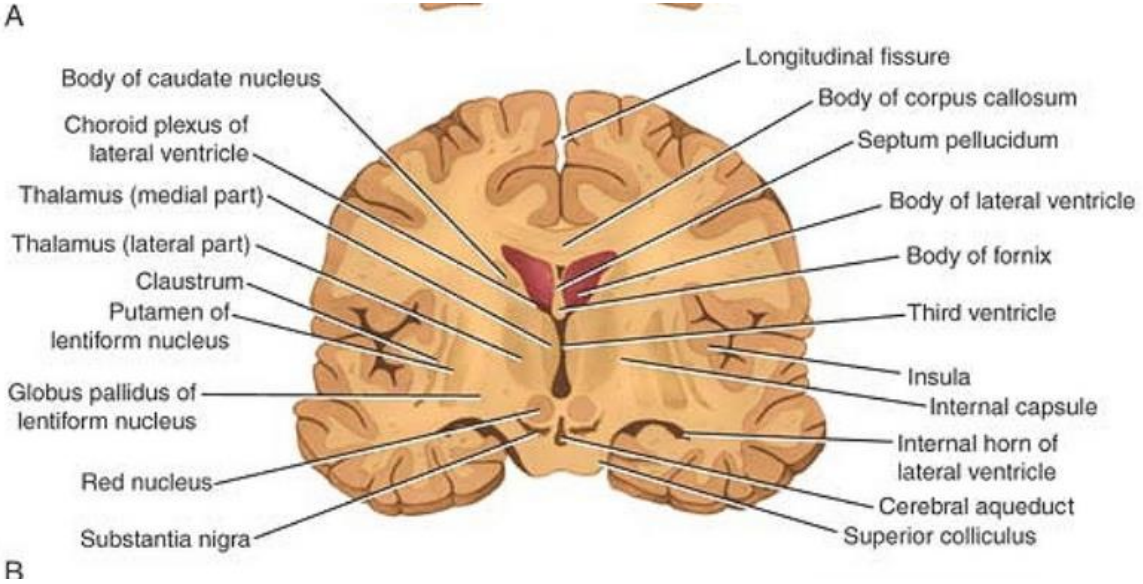




Lateral Ventricles

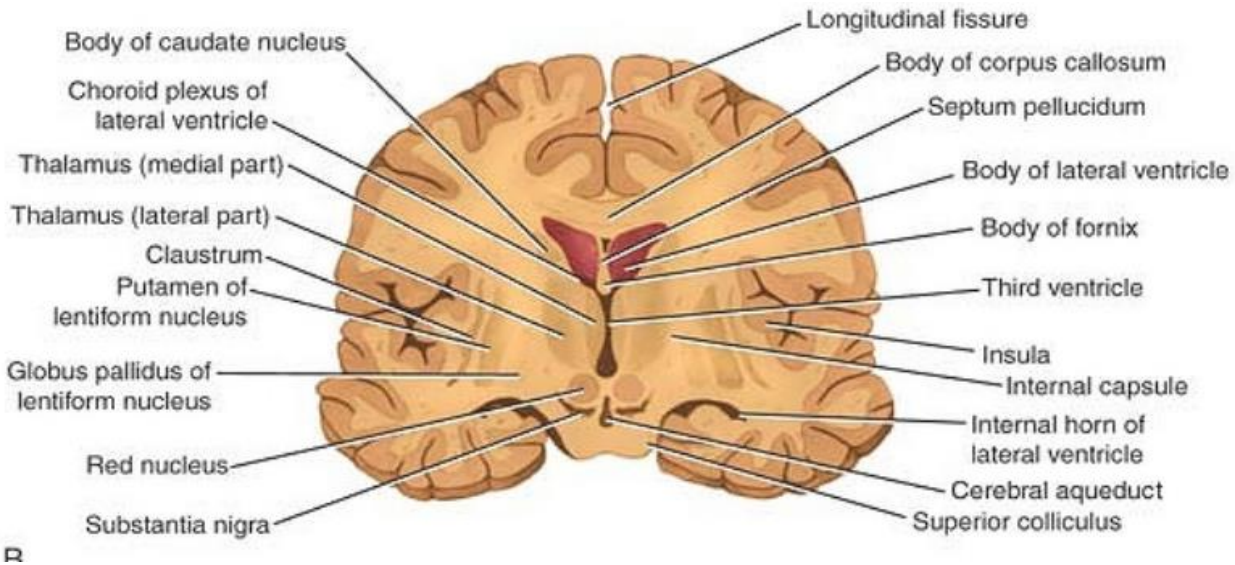
- Body of the lateral ventricle extends from the interventricular foramen posteriorly as far as the posterior end of the thalamus.
- Here, it becomes continuous with the posterior and the inferior horns.
- The body of the lateral ventricle has a roof, a floor, and a medial wall .

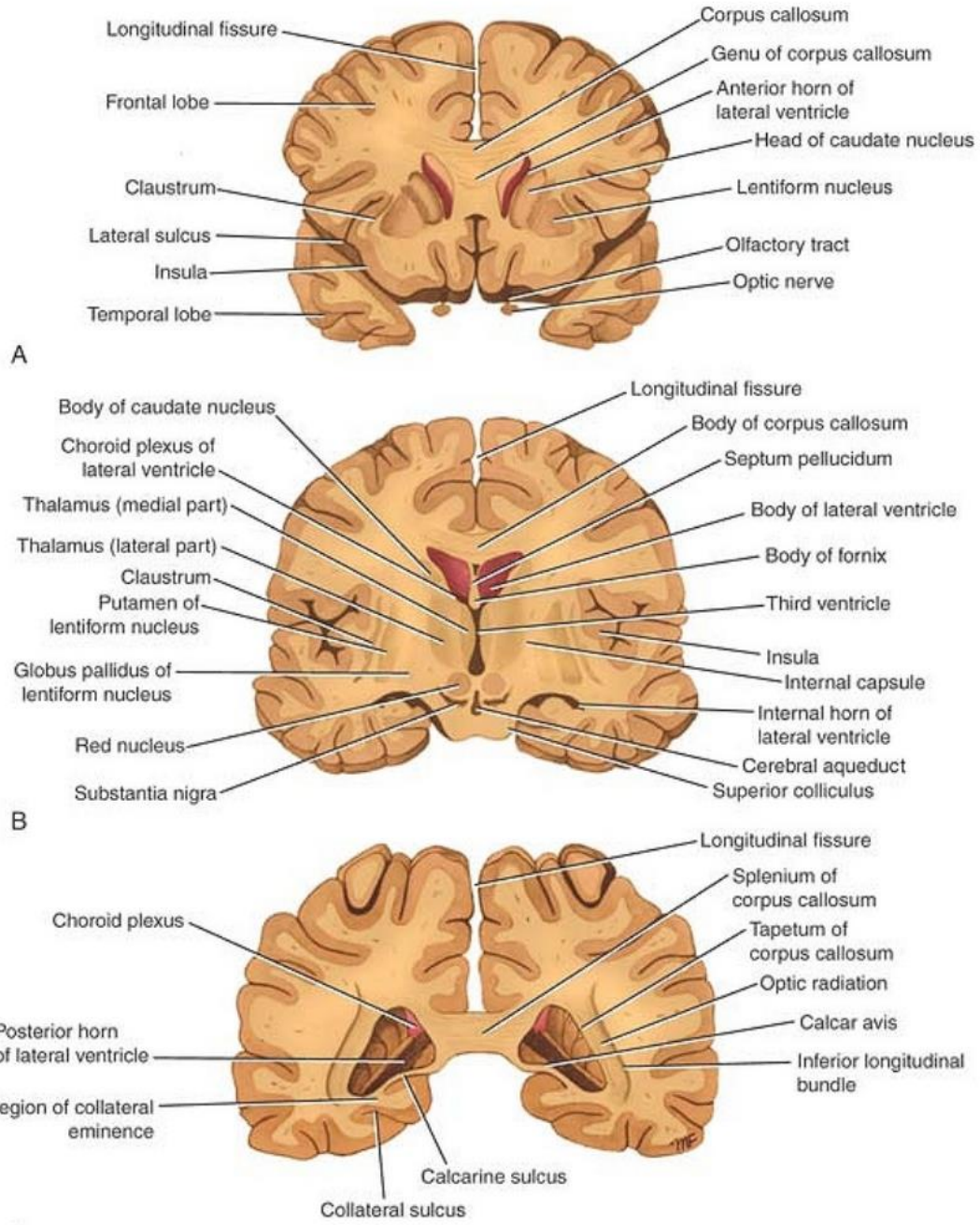




Lateral Ventricles

- Roof is formed by the undersurface of the corpus callosum .
- Floor is formed by the body of the caudate nucleus and the lateral margin of the thalamus.

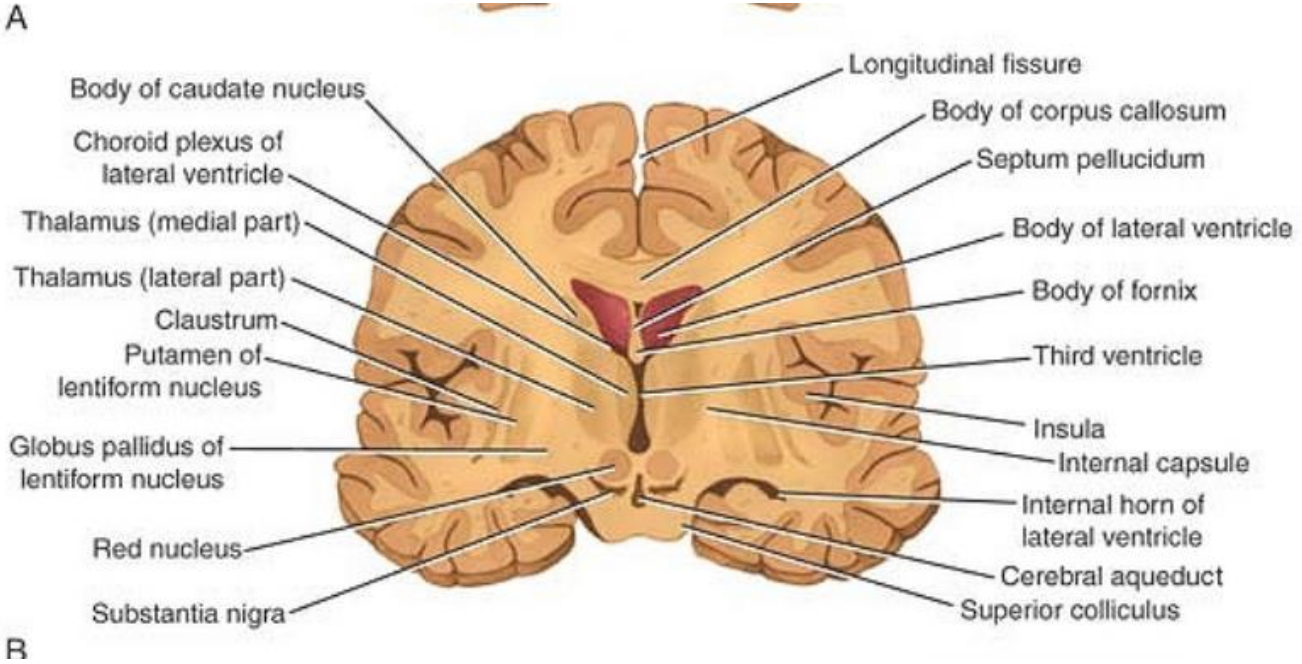



Longitudinal fissure
Frontal lobe
Claustrum
Lateral sulcus
Insula
Temporal lobe
Corpus callosum
Genu of corpus callosum
Anterior horn of lateral ventricle
Head of caudate nucleus
Lentiform nucleus
Olfactory tract
Optic nerve
A
Body of caudate nucleus
Choroid plexus of lateral ventricle
Thalamus (medial part)
Thalamus (lateral part)
Claustrum
Putamen of lentiform nucleus
Globus pallidus of lentiform nucleus
Red nucleus
Substantia nigra
Longitudinal fissure
Body of corpus callosum
Septum pellucidum
Body of lateral ventricle
Body of fornix
Third ventricle
Insula
Internal capsule
Internal horn of lateral ventricle
Cerebral aqueduct
Superior colliculus
B
Choroid plexus
Posterior horn of lateral ventricle
Region of collateral eminence
Calcarine sulcus
Collateral sulcus
Longitudinal fissure
Splenium of corpus callosum
Tapetum of corpus callosum
Optic radiation
Calcar avis
Inferior longitudinal bundle
C

Lateral Ventricles

Medial wall of body of lateral ventrical

- Is formed by the septum pellucidum anteriorly
- Posteriorly, the roof and the floor come together on the medial wall



Lateral Ventricles

Anterior horn of the lateral ventricle

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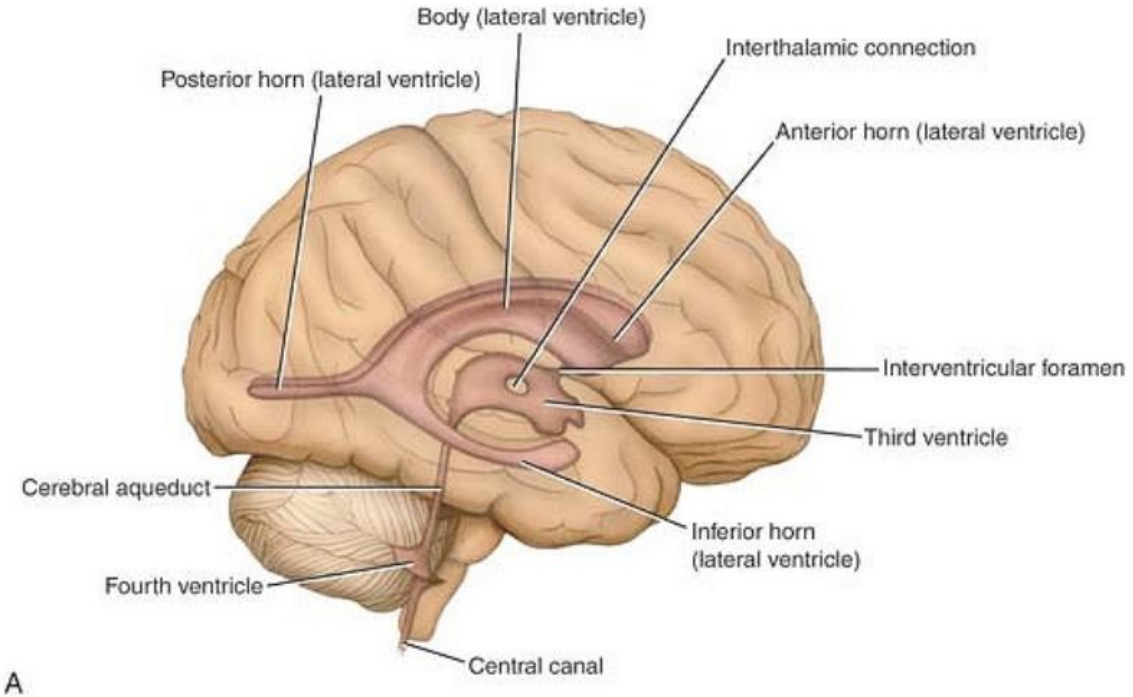
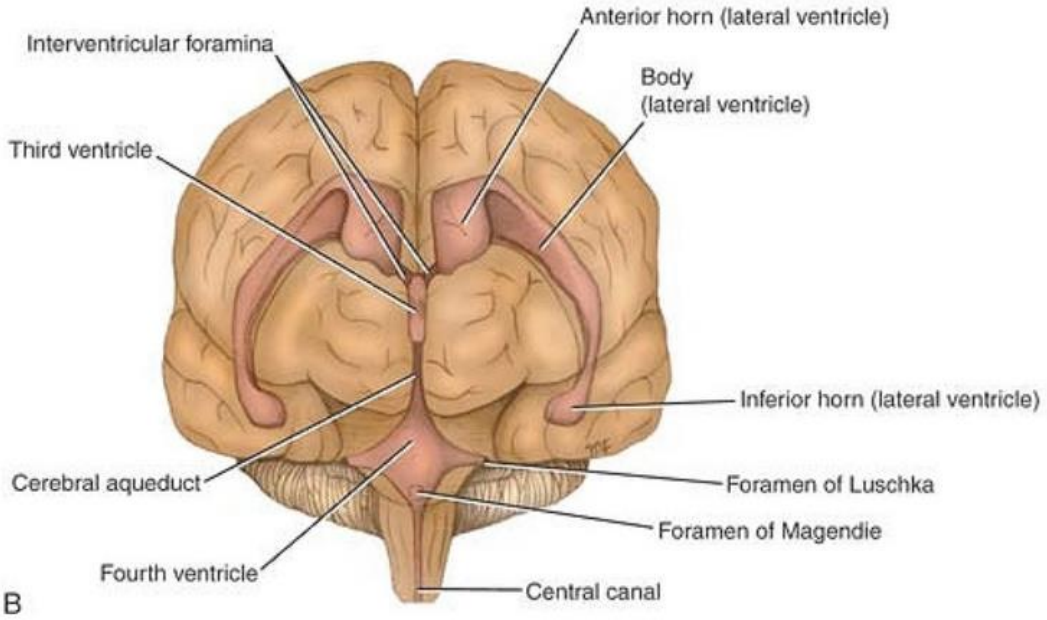
- It is continuous posteriorly with the body of the ventricle at the interventricular foramen.





Lateral Ventricles

The anterior horn has a roof, a floor, and a medial wall.

Roof

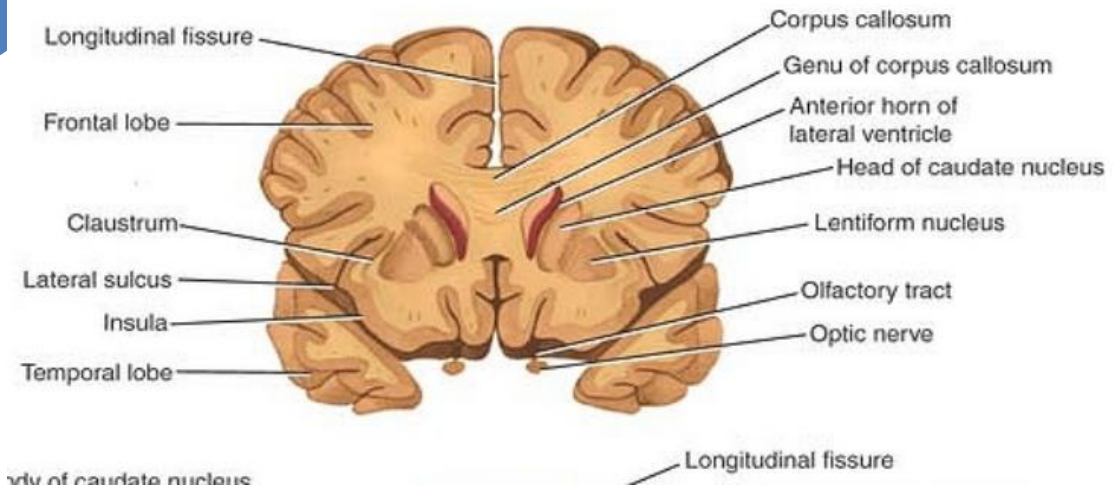
- Is formed by the undersurface of the anterior part of the corpus callosum;
- The genu of the corpus callosum limits the anterior horn anteriorly

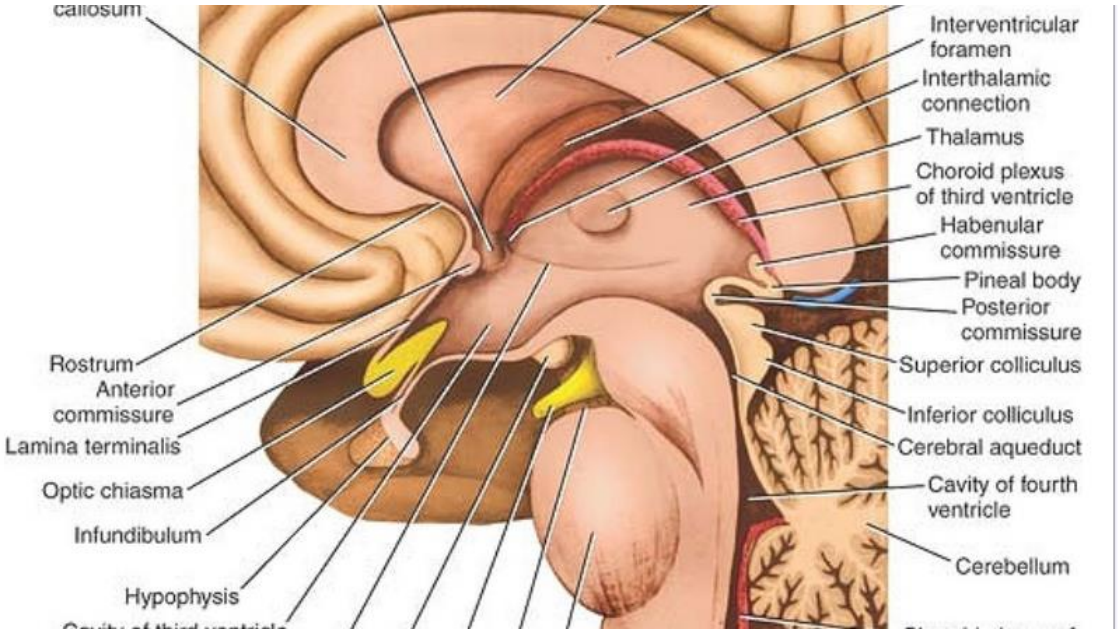
Floor

- Is formed by the rounded head of the caudate nucleus medially
- A small portion is formed by the superior surface of the rostrum of the corpus callosum.

Medial wall

- Is formed by the septum pellucidum and the anterior column of the fornix .





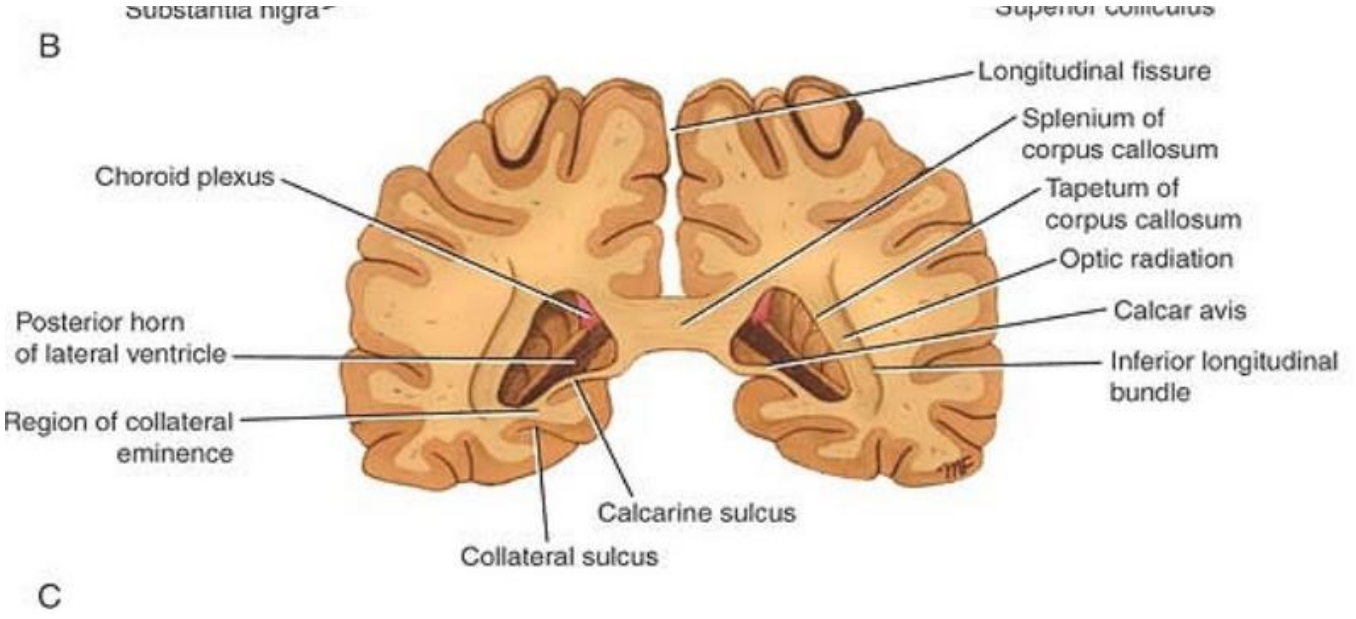
Lateral Ventricles

The posterior horn of the lateral ventricle

- Extends posteriorly into the occipital lobe .

Roof and lateral wall

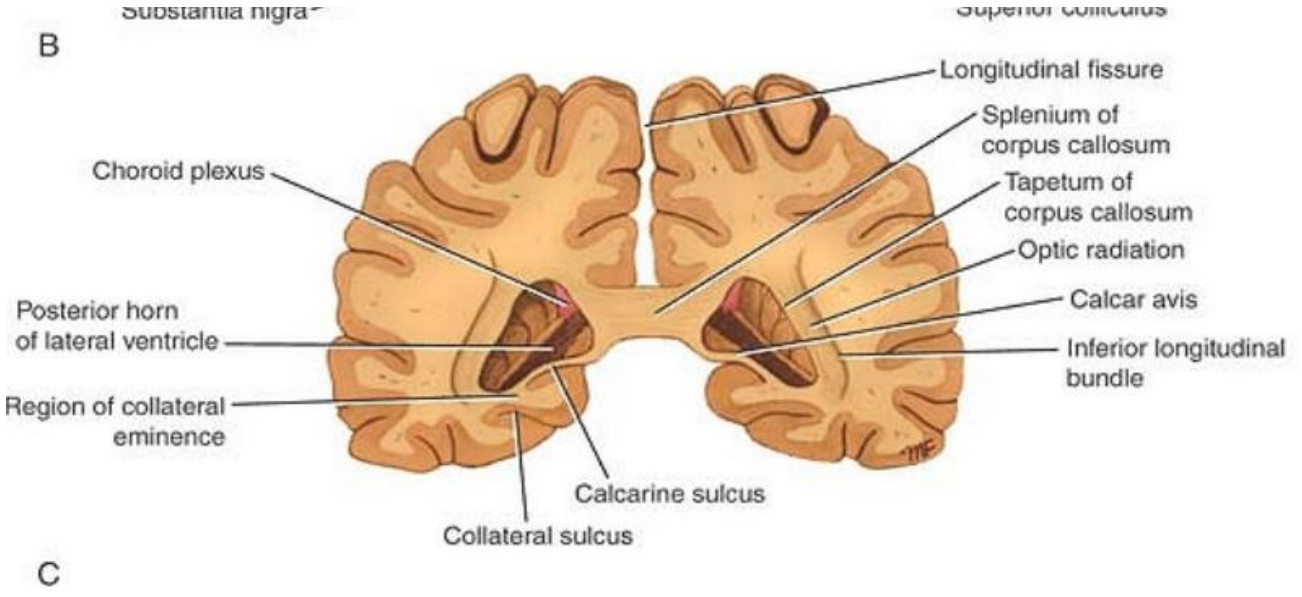
- Are formed by the fibers of the tapetum of the corpus callosum.
- Lateral to the tapetum are the fibers of the optic radiation .



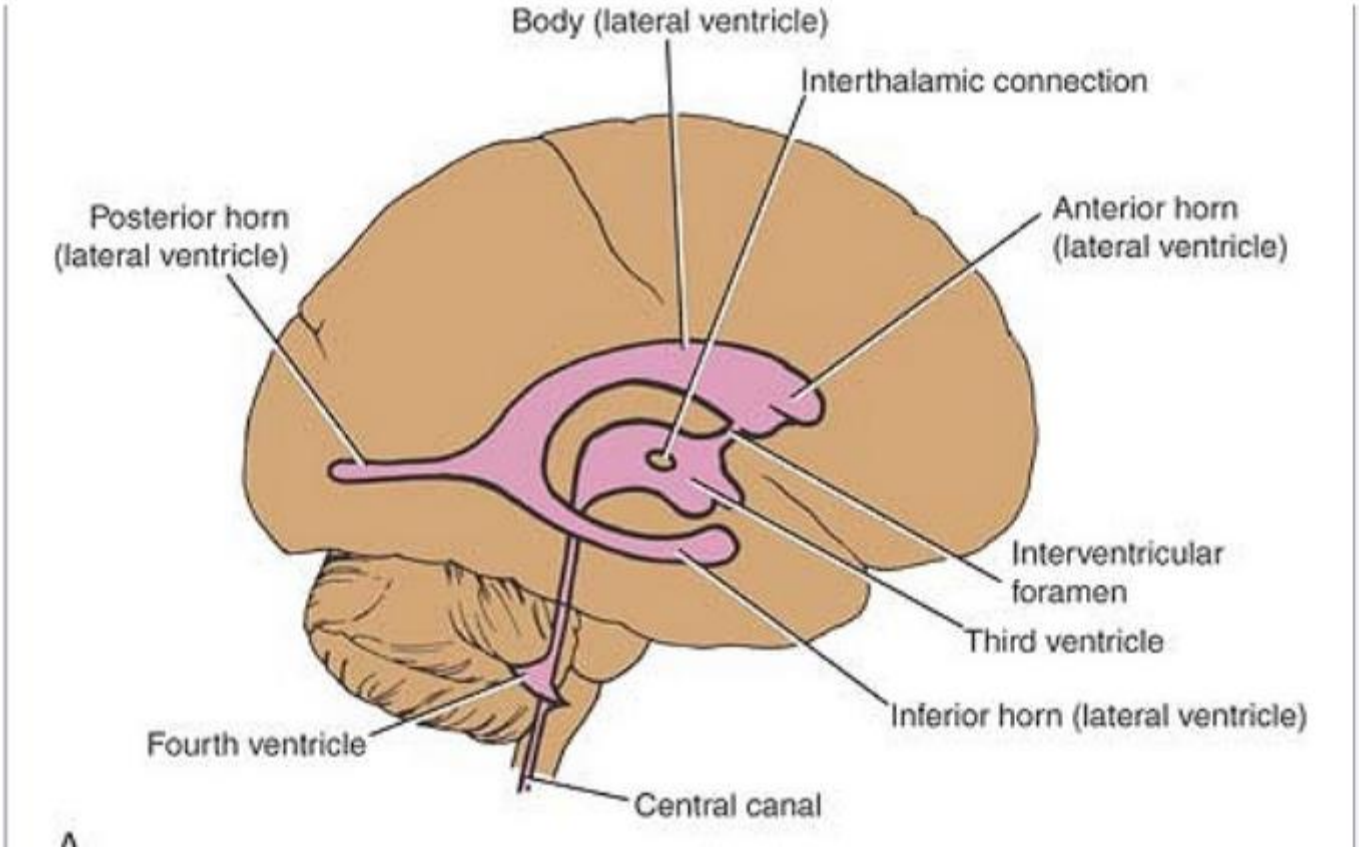
Lateral Ventricles

Medial wall of Posterior horn of the lateral ventricle

- Have the posterior horn has two elevations.
- The superior swelling is caused by the splenial fibers of the corpus callosum, called the forceps major, passing posteriorly into the occipital lobe
- This superior swelling is referred to as the bulb of the posterior horn.
- The inferior swelling is produced by the calcarine sulcus and is called the calcar avis .



Inferior horn of the lateral ventricle



Lateral Ventricles

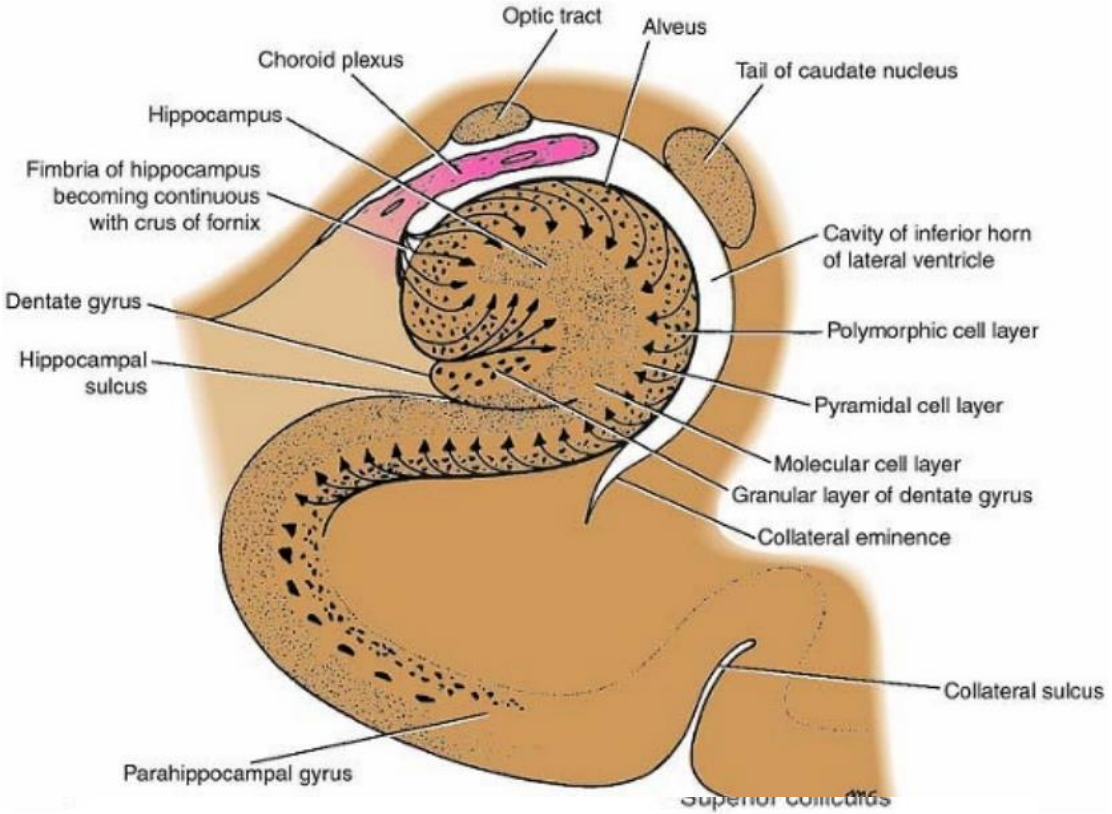
Inferior horn of the lateral ventricle

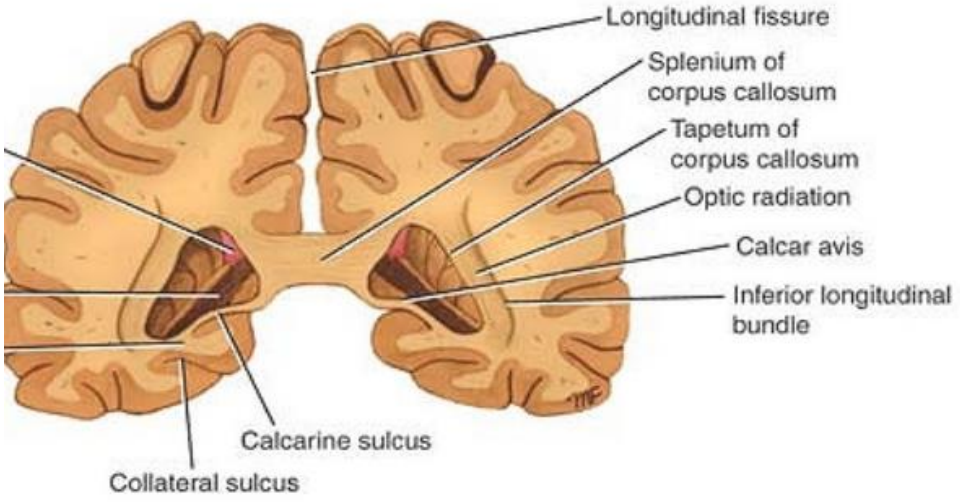
- Extends anteriorly into the temporal lobe.

Has a roof and a floor .

Roof

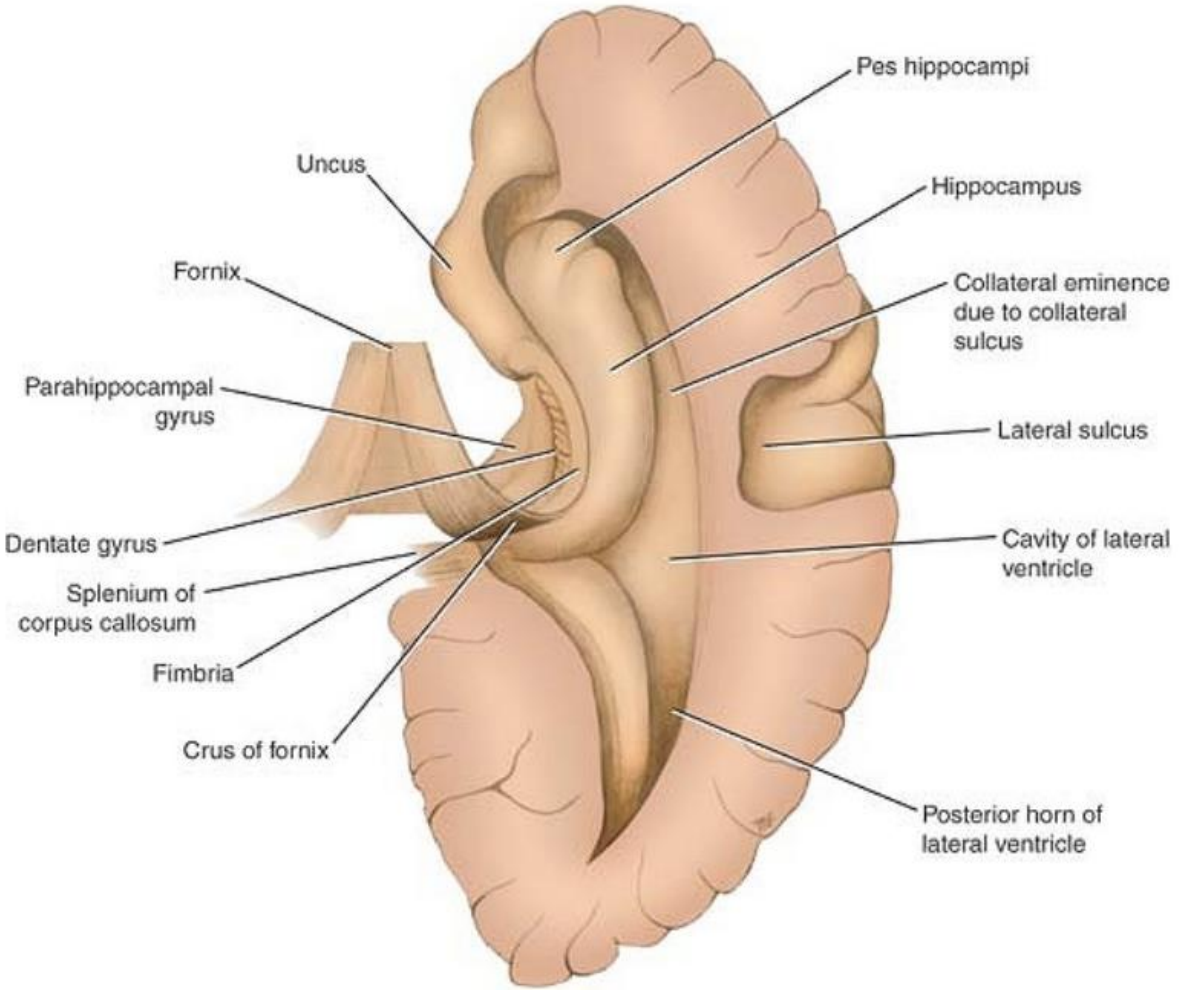
- Is formed by the inferior surface of the tapetum of the corpus callosum
- And by the tail of the caudate nucleus .
- The latter passes anteriorly to end in the amygdaloid nucleus.





Floor of inferior horn of the lateral ventricle

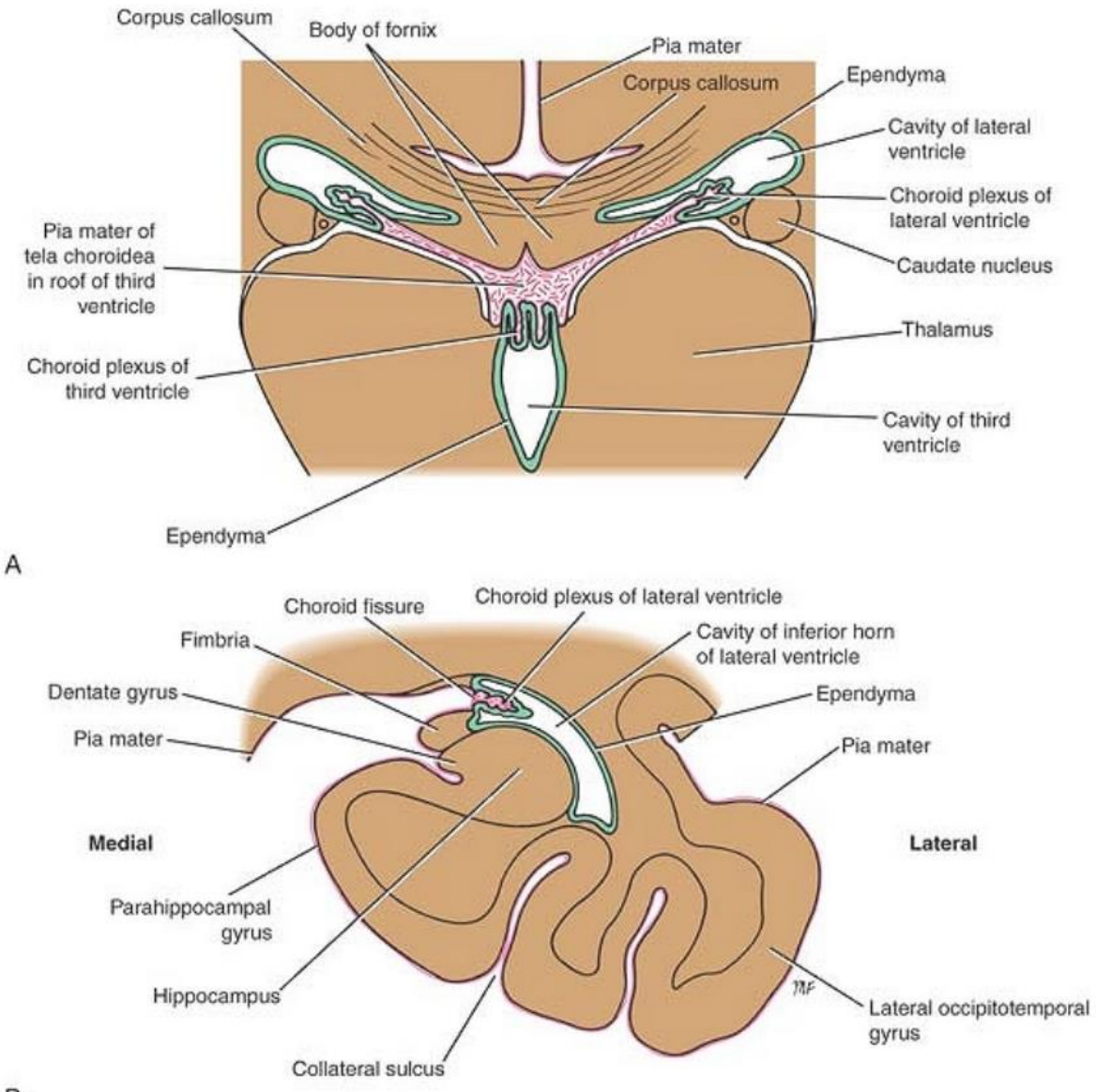
- Is formed laterally by the collateral eminence produced by the collateral fissure, and medially by the hippocampus .
- The anterior end of the hippocampus is expanded
- And slightly furrowed to form the peshippocampus.
- The hippocampus is composed of gray matter




Thank you!

Lateral Ventricles

- Choroid plexus of the ventricle projects into the body of the ventricle
- Through the slitlike gap between the body of the fornix and the superior surface of the thalamus.
- This slitlike gap is known as the choroidal fissure
- Through it, the blood vessels of the plexus invaginate the pia mater of the tela choroidea and the ependyma of the lateral ventricle.

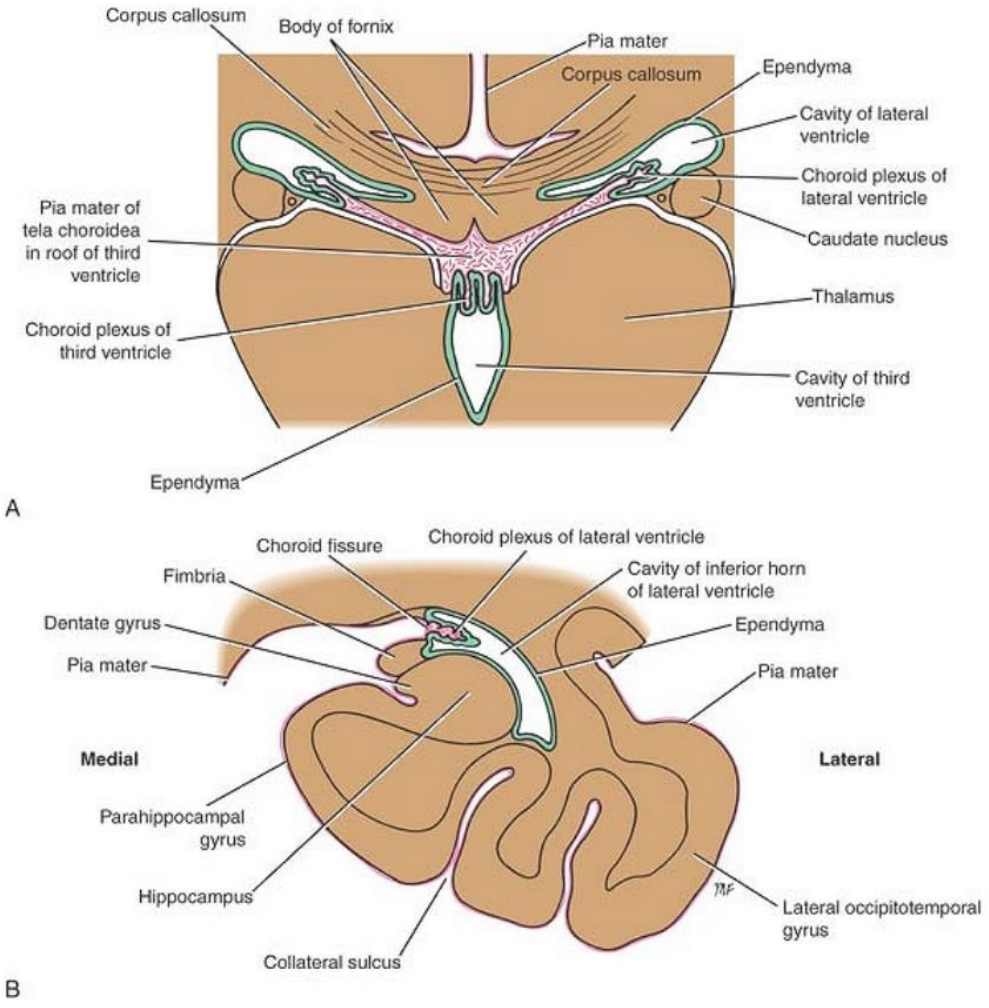


Choroid Plexus of the Lateral Ventricle

- The choroid plexus projects into the ventricle on its medial aspect .

Choroid Plexus

- Is in fact, the irregular lateral edge of the tela choroidea, which is a two-layered fold of pia mater
- Situated between the fornix superiorly and the upper surface of the thalamus .
- The function of the choroid plexus is to produce cerebrospinal fluid



Third Ventricle

- The third ventricle is a slitlike cleft between the two thalami.
- It communicates anteriorly with the lateral ventricles through the interventricular foramina (of Monro) and posteriorly with the fourth ventricle through the cerebral aqueduct (of Sylvius)
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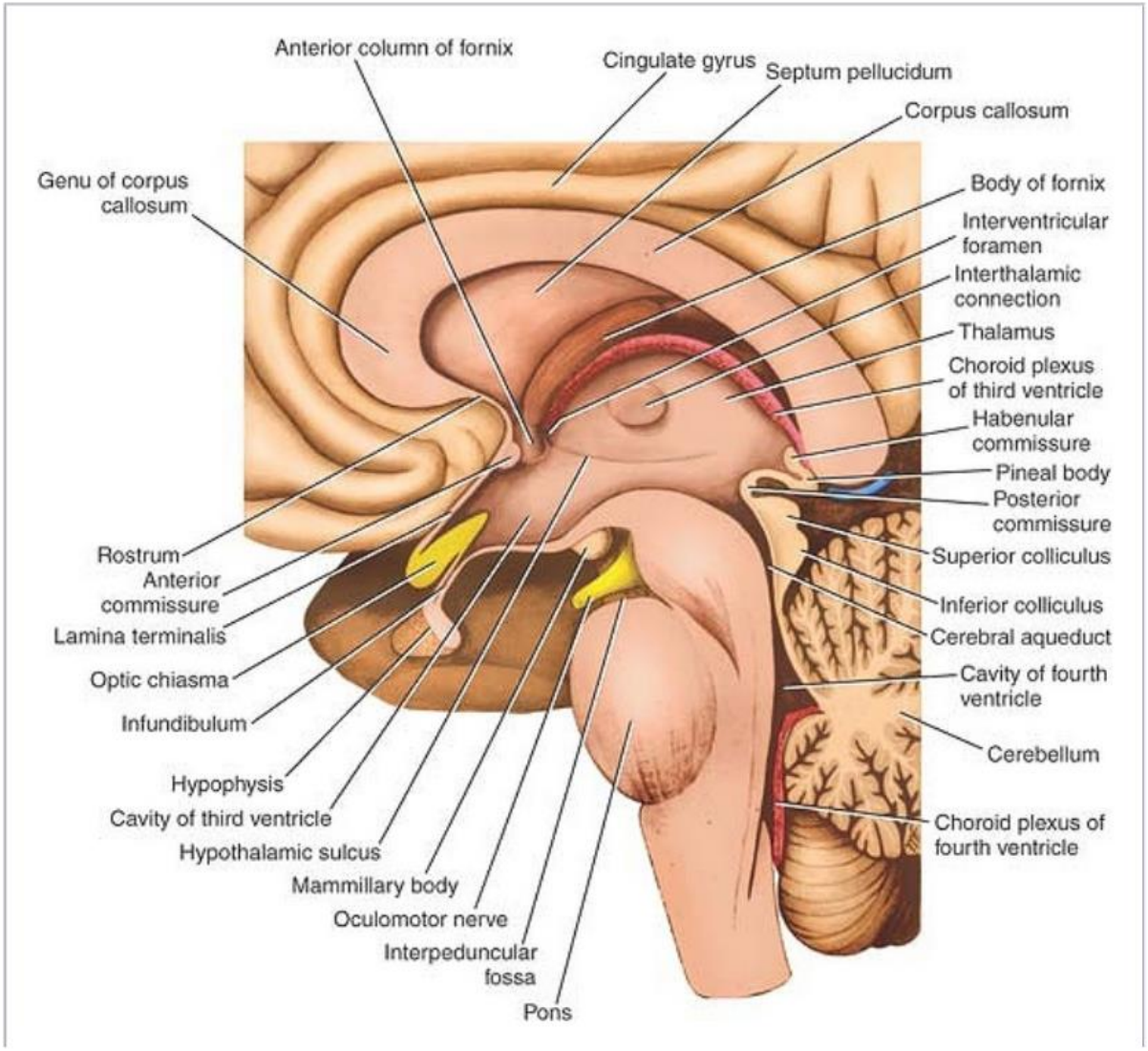
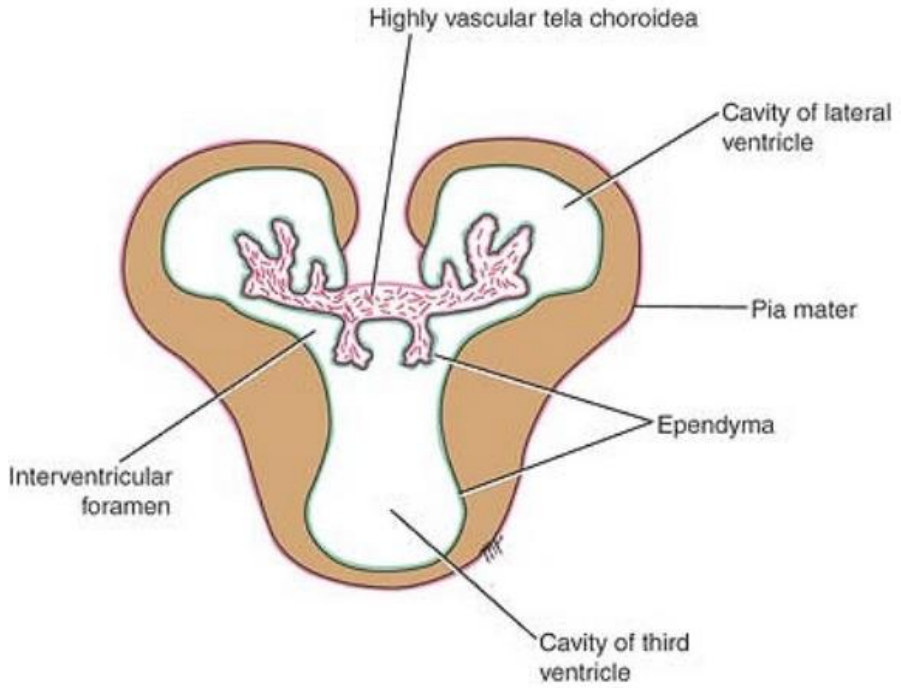
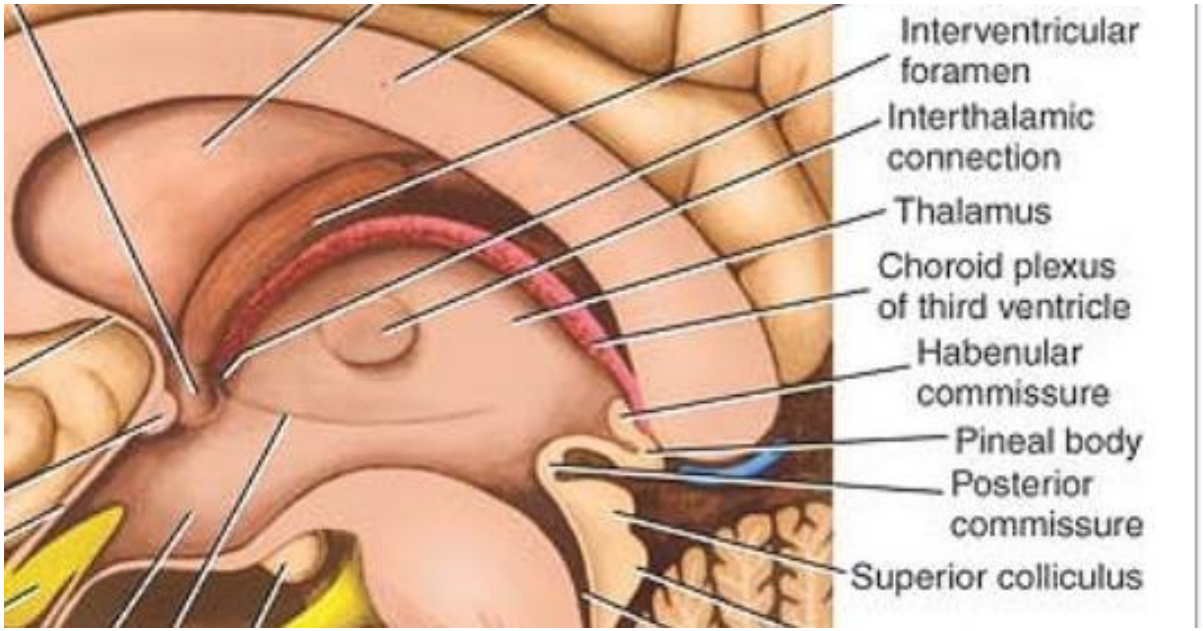


Choroid Plexuses of the Third Ventricle

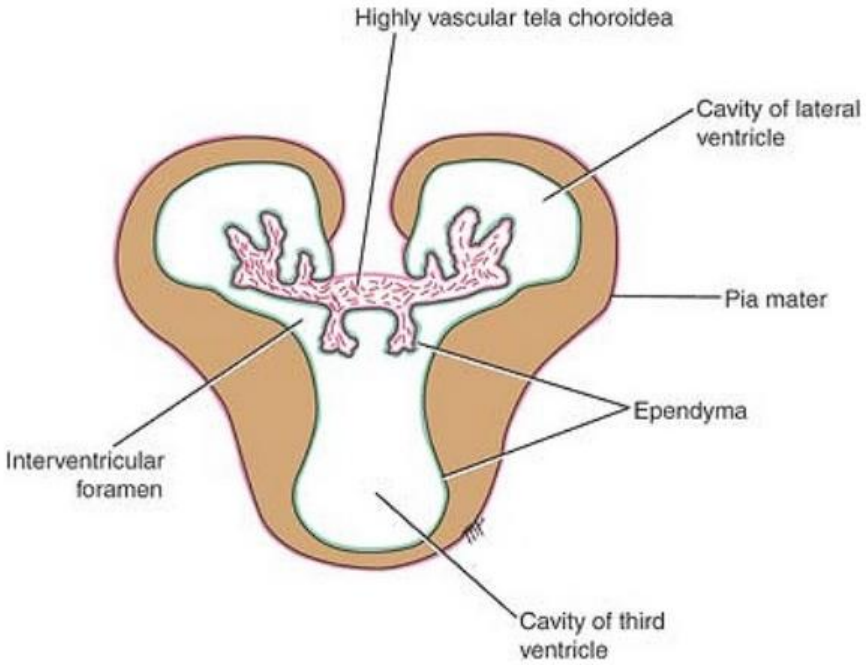
- The choroid plexuses are formed from the tela choroidea situated above the roof of the ventricle .
- The vascular tela choroidea projects downward on each side of the midline, invaginating the ependymal roof of the ventricle.
- The two vascular ridges or fringes that hang from the roof of the third ventricle form the choroid plexuses.





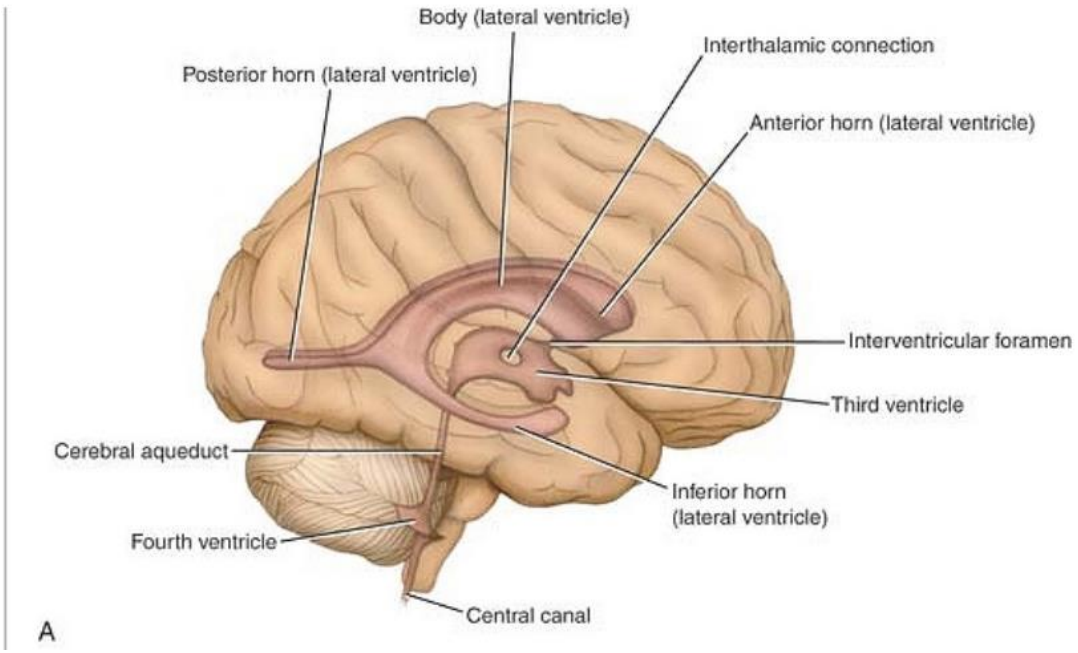
Choroid Plexuses of the Third Ventricle

- Blood supply of the tela choroidea in the third and lateral ventricles
- Is derived from the choroidal branches of the internal carotid and basilar arteries.
- Venous blood drains into the internal cerebral veins, which unite to form the great cerebral vein.
- The great cerebral vein joins the inferior sagittal sinus to form the straight sinus.



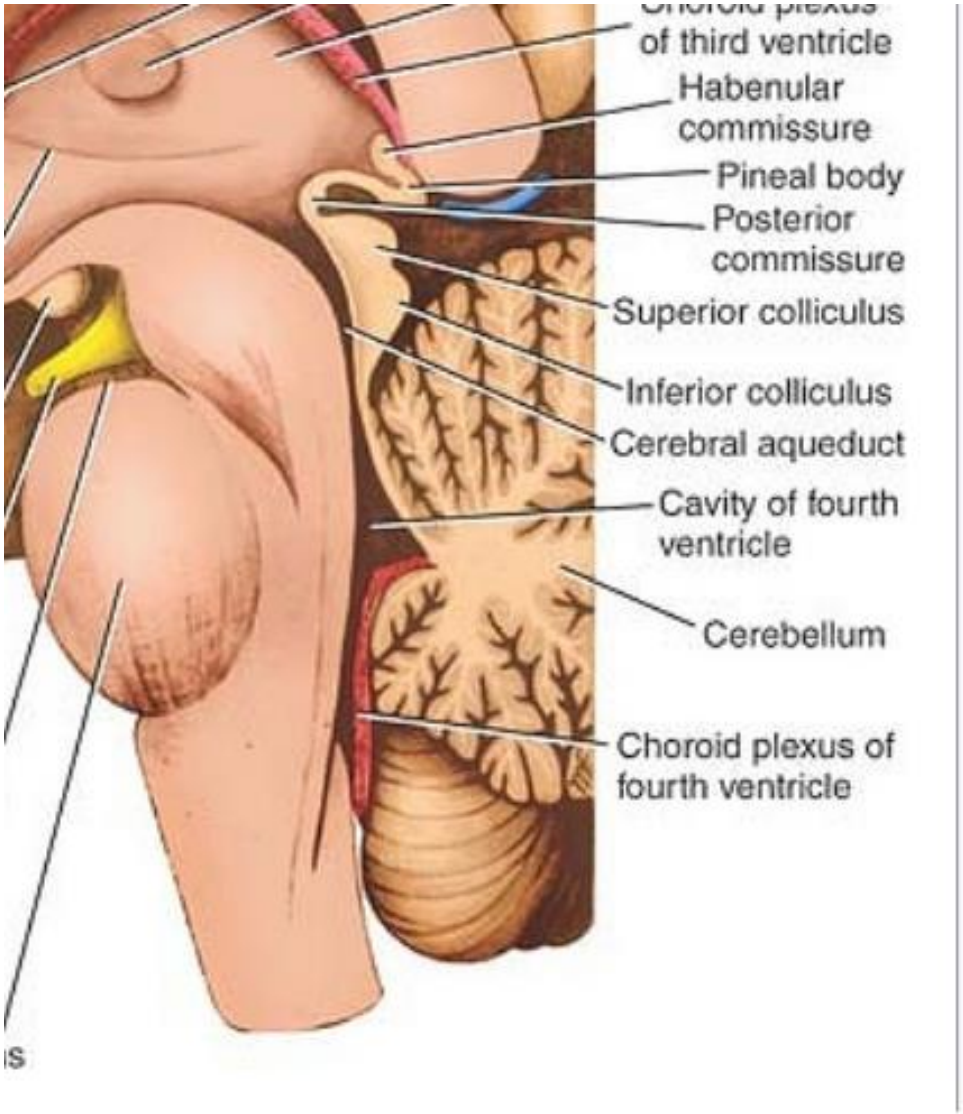
Cerebral Aqueduct

- The cerebral aqueduct (aqueduct of Sylvius),
- A narrow channel about of an inch (1.8 cm) long
- Connects the third ventricle with the fourth ventricle .
- It is lined with ependyma.
- Direction of flow of cerebrospinal fluid is from the third to the fourth ventricle.
- There is no choroid plexus in the cerebral aqueduct.



Fourth Ventricle

- Is a tent-shaped cavity filled with cerebrospinal fluid.
- It is situated anterior to the cerebellum and posterior to the pons and the superior half of the medulla oblongata



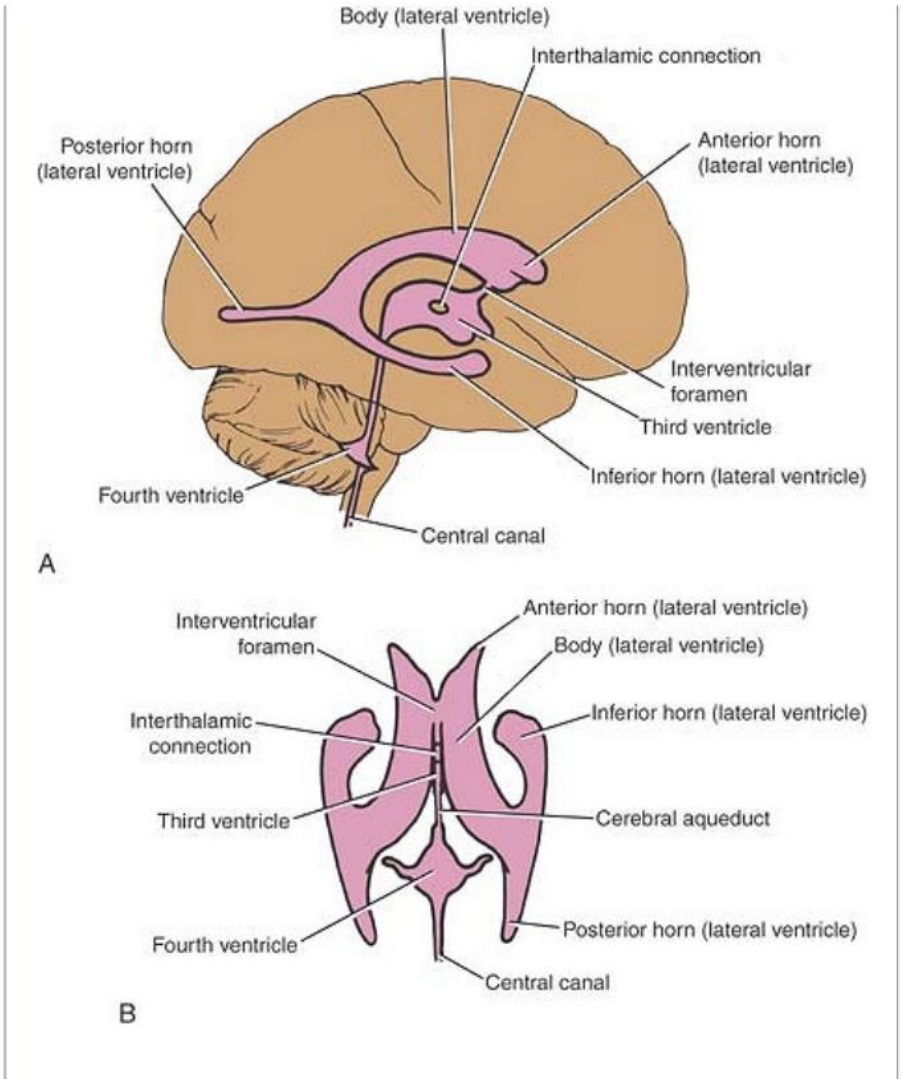
Fourth Ventricle

- It is lined with ependyma
- And is continuous above with the cerebral aqueduct of the midbrain

- And below with the central canal of the medulla oblongata and the spinal cord .

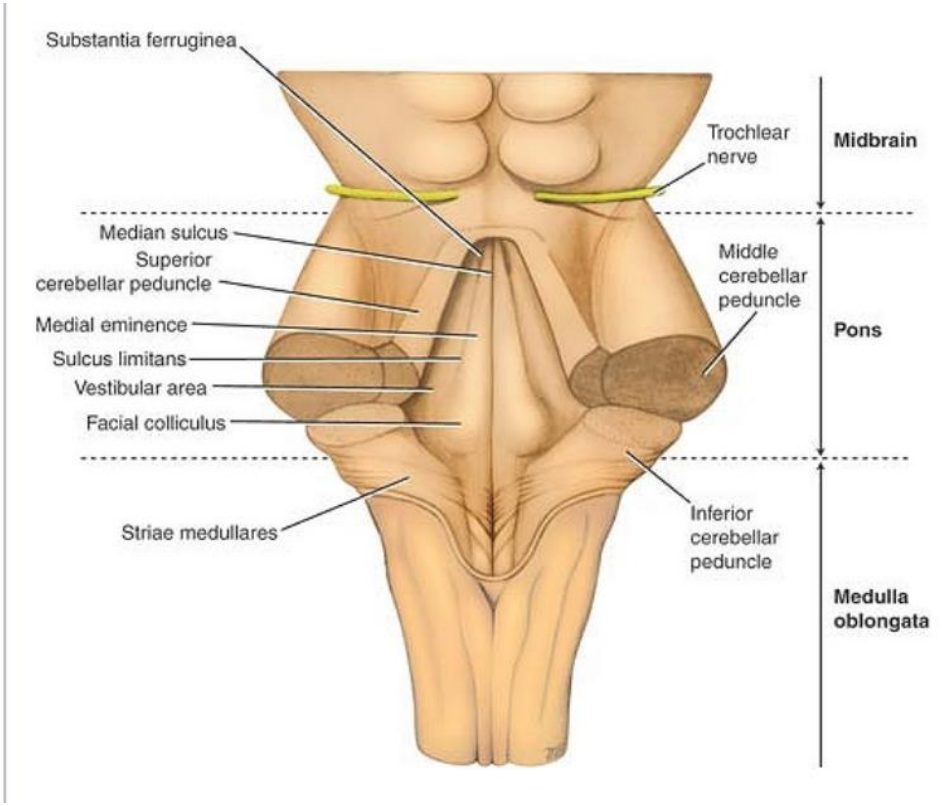
Fourth ventricle have

- lateral boundaries
- A roof, and a rhomboid-shaped floor.



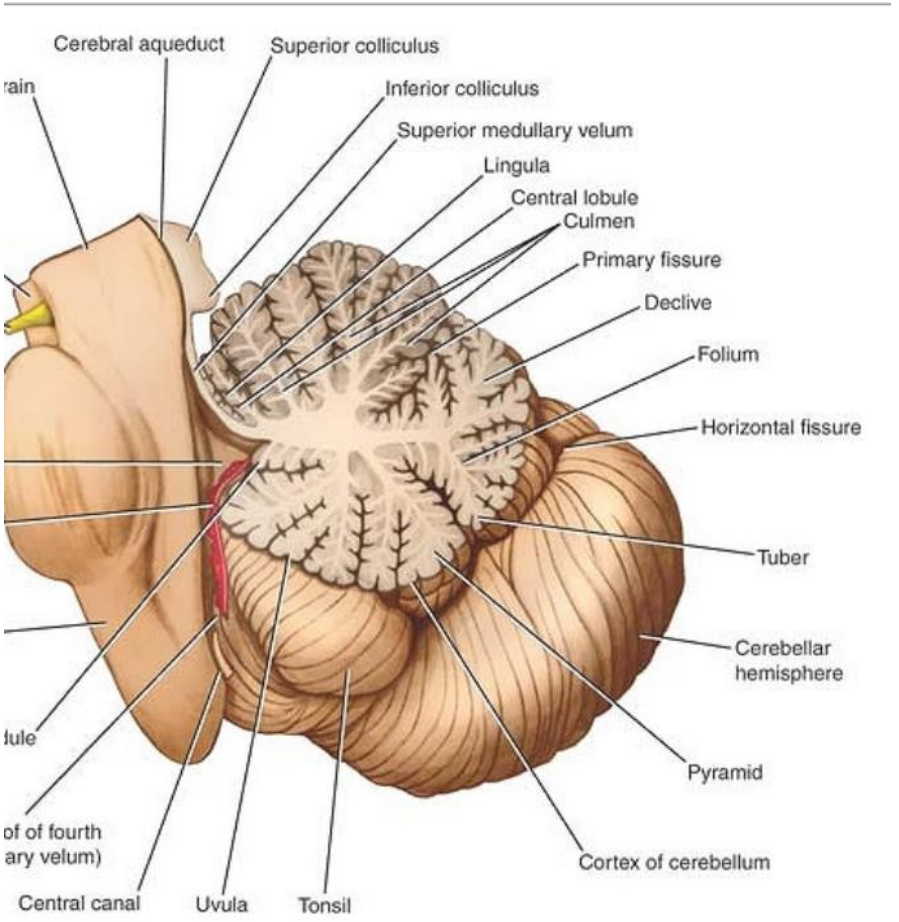
Lateral Boundaries of Fourth Ventricle

- The caudal part of each lateral boundary is formed by the inferior cerebellar peduncle.
- The cranial part of each lateral boundary is formed by the superior cerebellar peduncle.



Roof or Posterior Wall

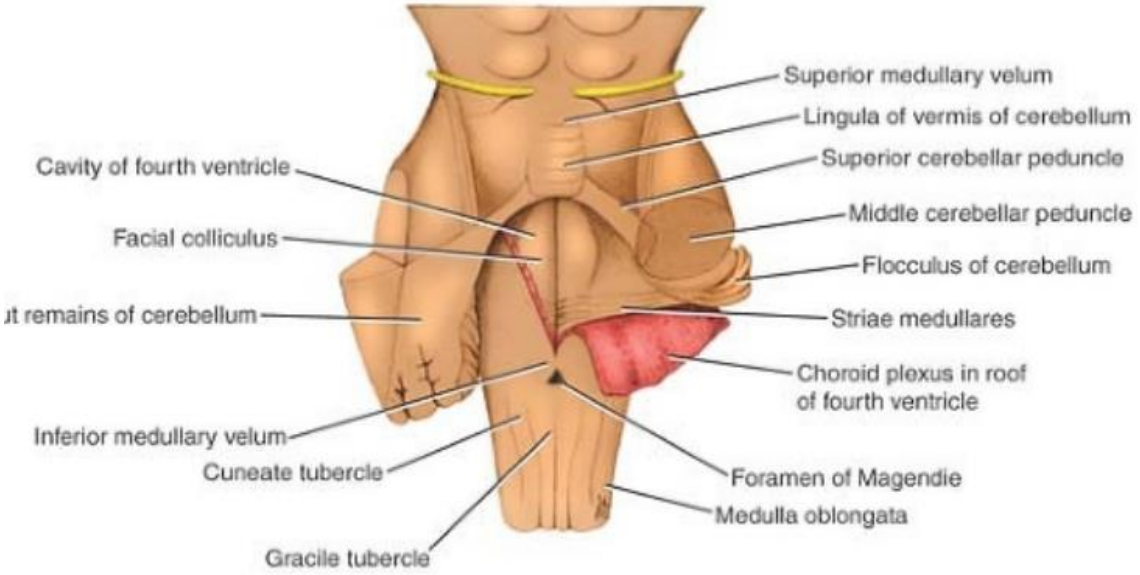
- The tent-shaped roof projects into the cerebellum .



Roof or Posterior Wall

Superior part

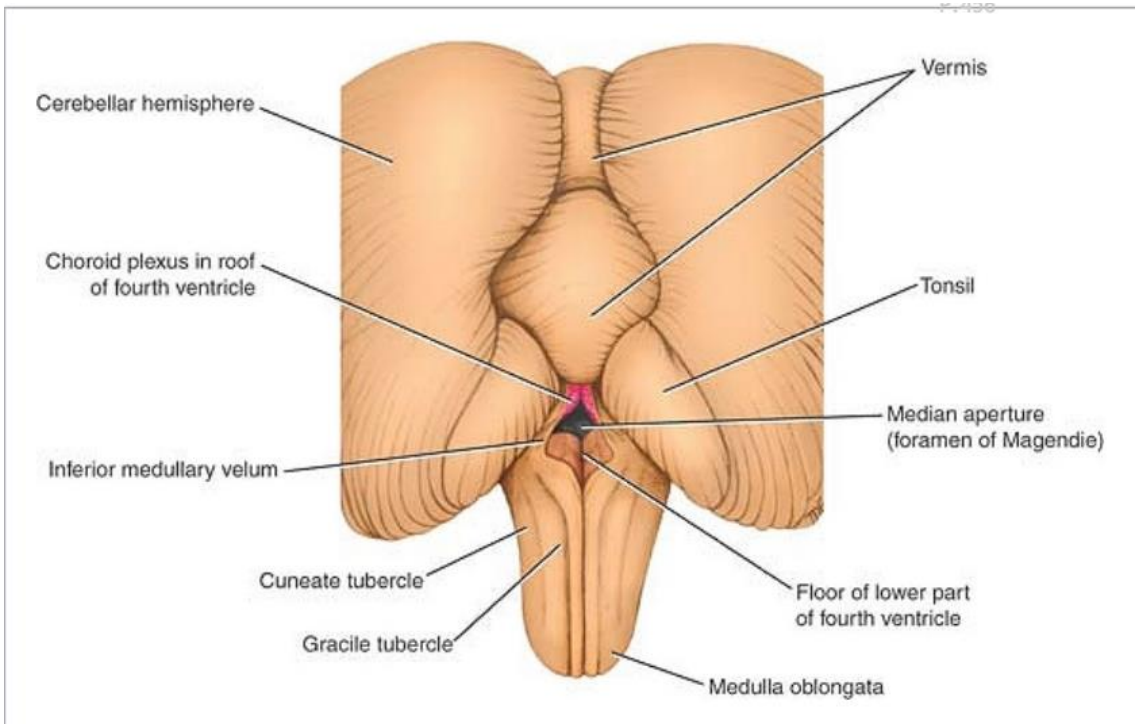
- Is formed by the medial borders of the two superior cerebellar peduncles
- And a connecting sheet of white matter called the superior medullary velum.



Roof or Posterior Wall

Inferior part

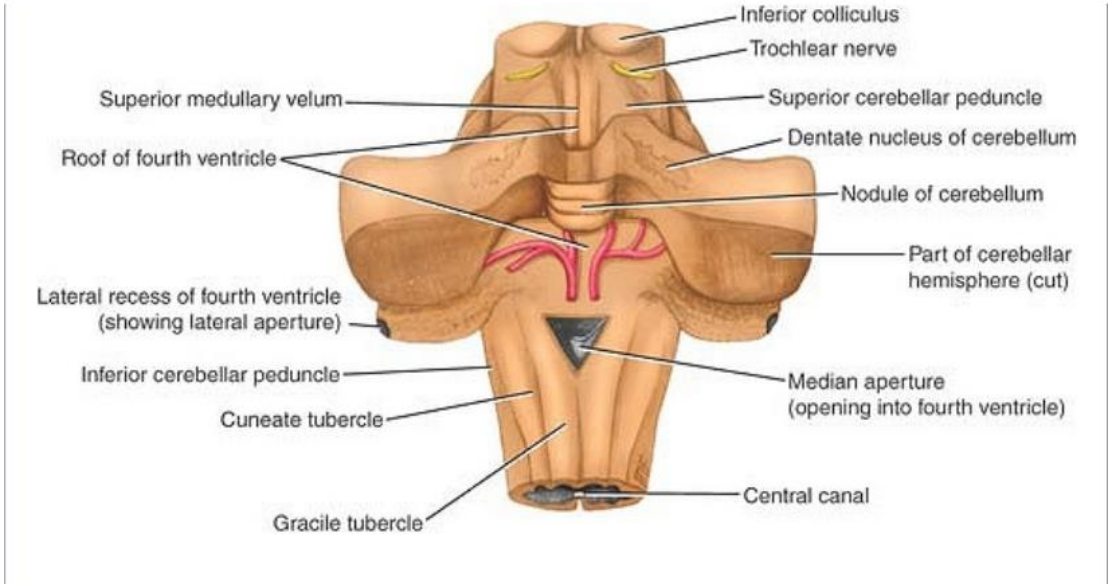
- Is formed by the inferior medullary velum .
- This part of the roof is pierced in the midline by a large aperture
- Median aperture or foramen of Magendie .



Roof or Posterior Wall

Lateral recesses

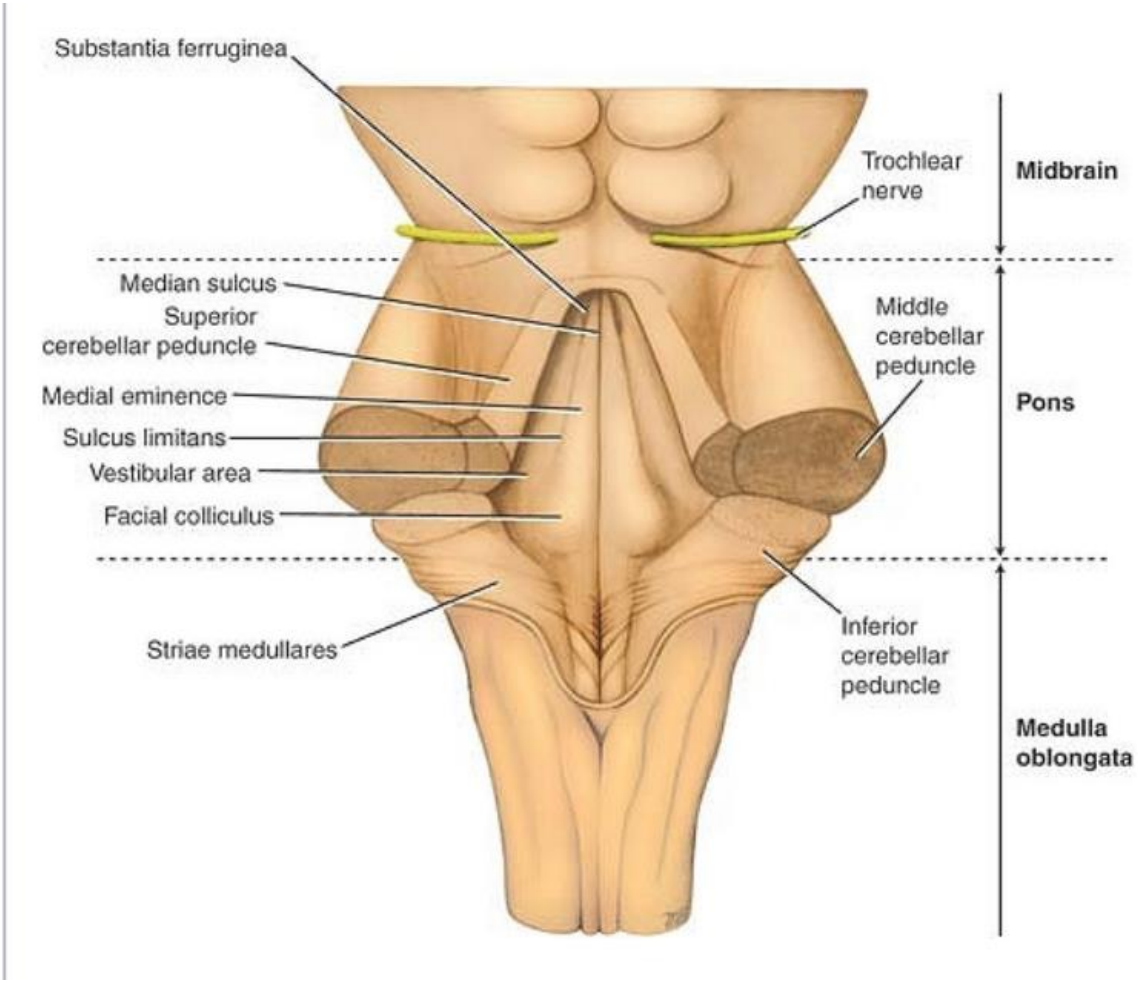
- Extend laterally around the sides of the medulla
- And open anteriorly as the lateral openings of the fourth ventricle, or the foramina of Luschka.
- Thus, the cavity of the fourth ventricle communicates with the subarachnoid space through a single median opening and two lateral apertures.
- These important openings permit the cerebrospinal fluid to flow from the ventricular system into the subarachnoid space.



Floor or Rhomboid Fossa

Diamond-shaped floor

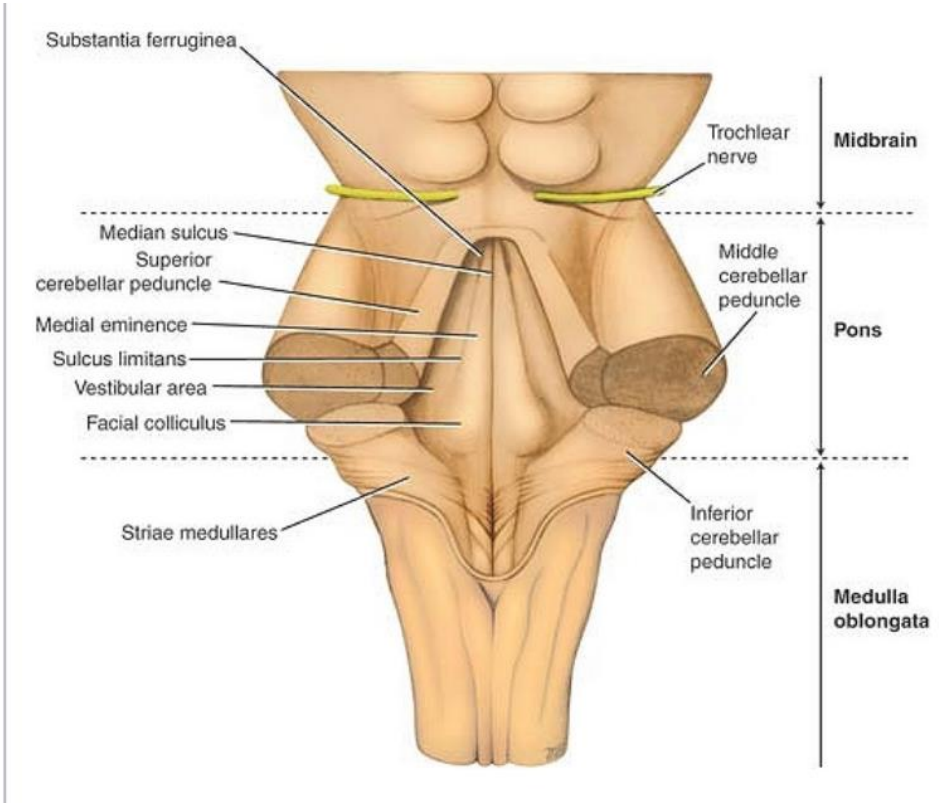
- Is formed by the posterior surface of the pons and the cranial half of the medulla oblongata .
- The floor is divided into symmetrical halves by the median sulcus.
- On each side of this sulcus, there is an elevation, the medial eminence



Floor or Rhomboid Fossa

Diamond-shaped floor

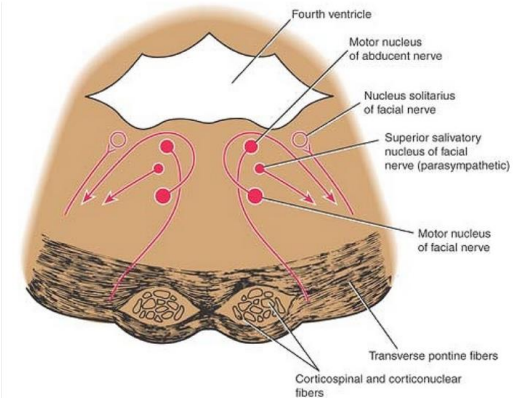
- Which is bounded laterally by another sulcus
- The sulcus limitans.
- Lateral to the sulcus limitans is an area known as the vestibular area .
- The vestibular nuclei lie beneath the vestibular area.

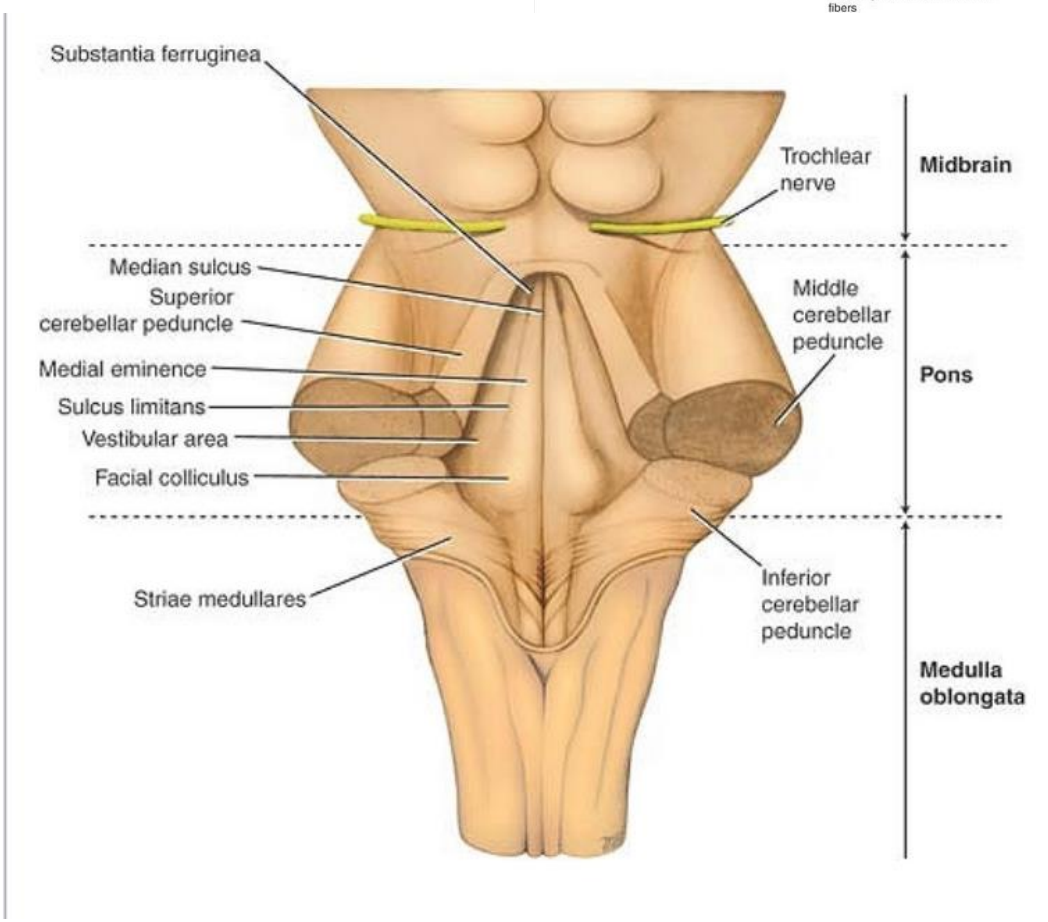


Floor or Rhomboid Fossa

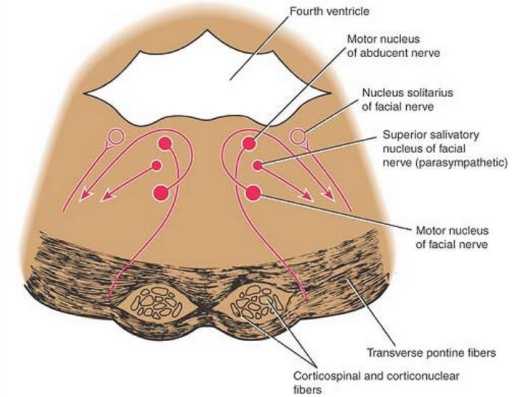
Facial colliculus

- Is a slight swelling at the inferior end of the medial eminence
- That is produced by the fibers from the motor nucleus of the facial nerve looping over the abducens nucleus .
- At the superior end of the sulcus limitans, there is a bluish-gray area,
- produced by a cluster of nerve cells containing melanin pigment;
- The cluster of cells is called the substantia ferruginea.

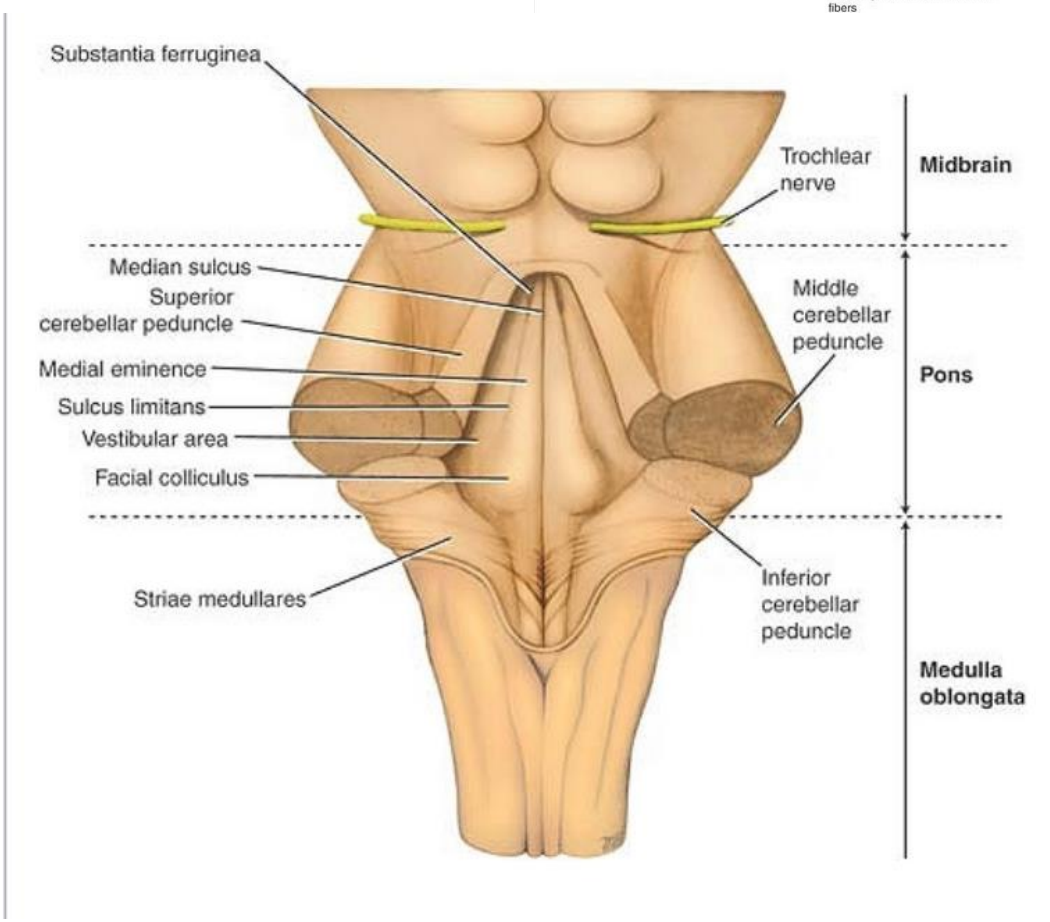




Floor or Rhomboid Fossa



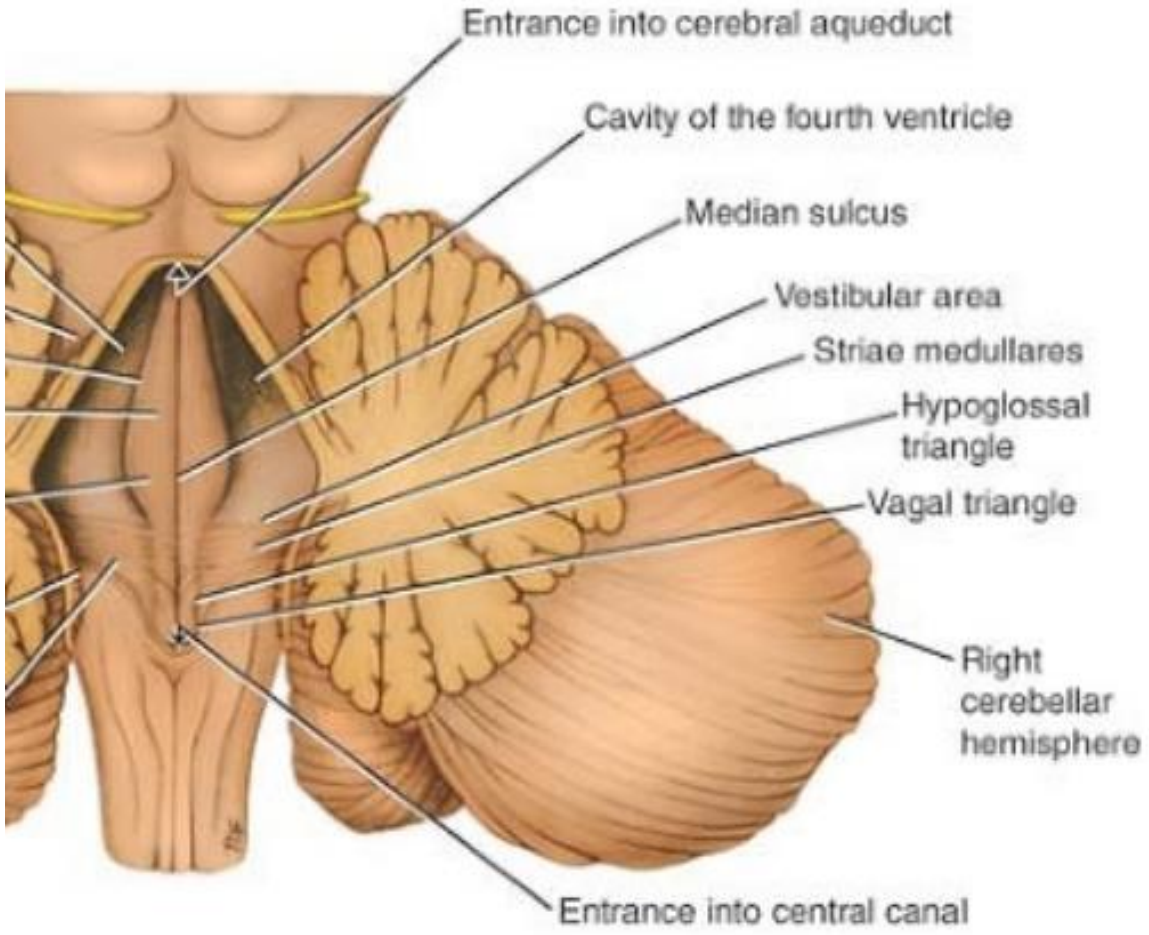
- Strands of nerve fibers, the striamedullaris
- Derived from the arcuate nuclei
- Emerge from the median sulcus
- And pass laterally over the medial eminence and the vestibular area
- And enter the inferior cerebellar peduncle to reach the cerebellum .



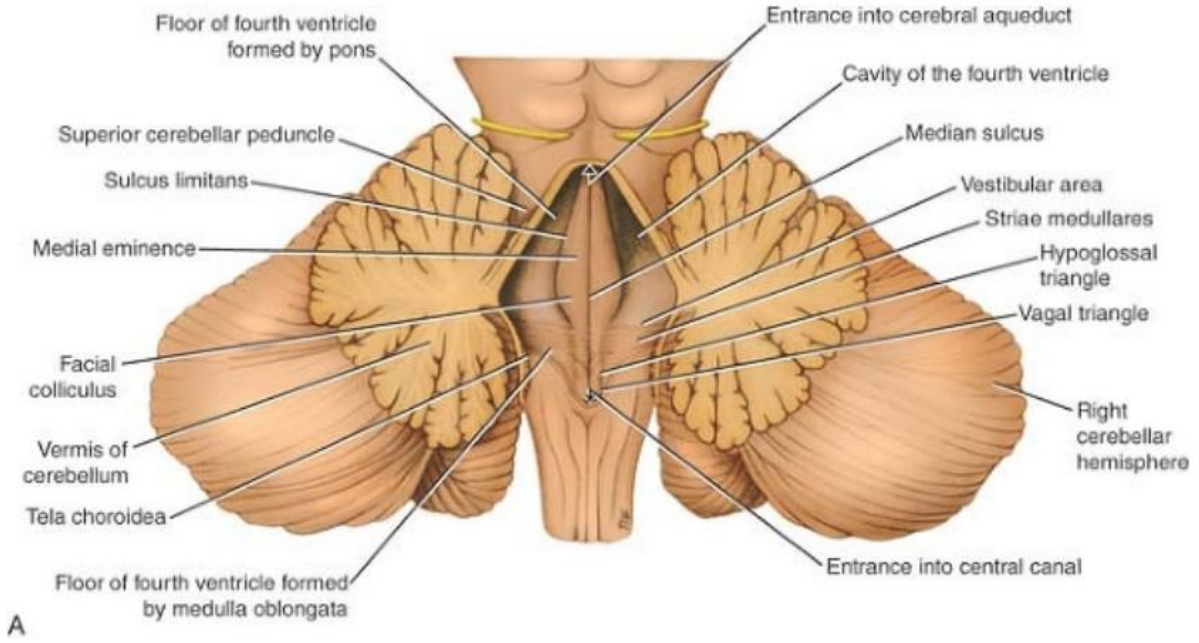
Floor or Rhomboid Fossa

Inferior to the stria medullaris

- The following features should be recognized in the floor of the ventricle.
- The most medial is the hypoglossal triangle
- Which indicates the position of the underlying hypoglossal nucleus .
- Lateral to this is the vagal triangle, beneath which lies the dorsal motor nucleus of the vagus.



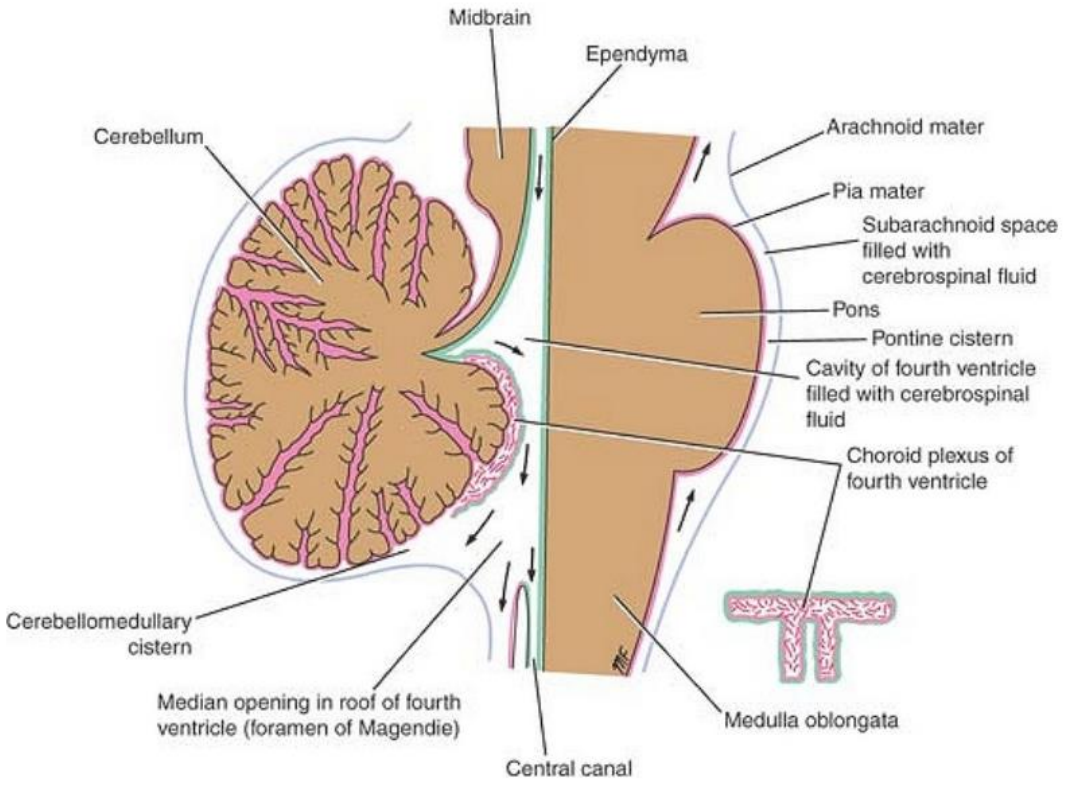
- The area postrema is a narrow area between the vagal triangle and the lateral margin of the ventricle, just rostral to the opening into the central canal.
- The inferior part of the vestibular area also lies lateral to the vagal triangle.



Choroid Plexus of the Fourth Ventricle

Choroid plexus

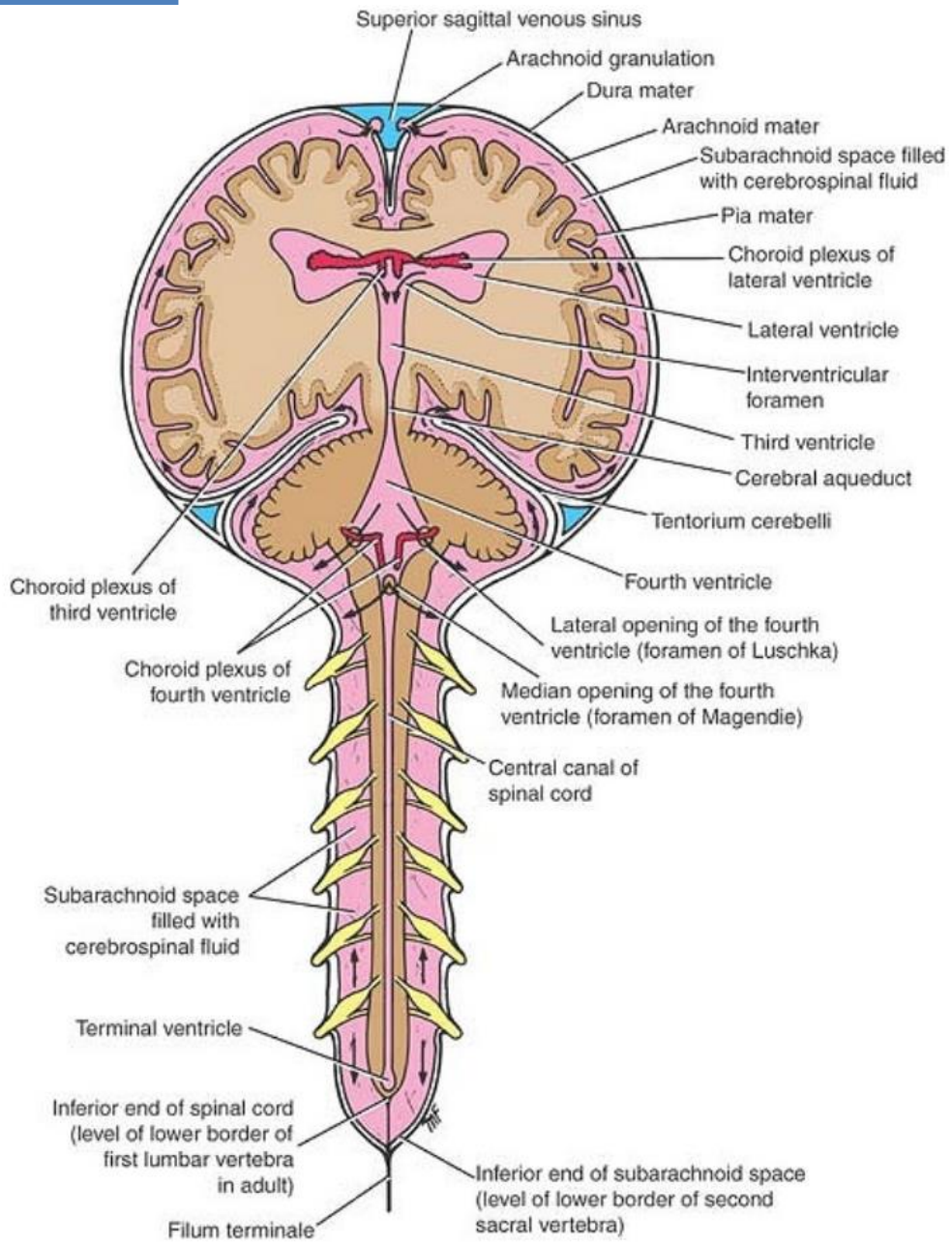
- Has a T shape; the vertical part of the T is double .
- It is suspended from the inferior half of the roof of the ventricle
- And is formed from the highly vascular tela choroidea.
- Tela choroidea is a two-layered fold of pia mater
- That projects through the roof of the ventricle and is covered by ependyma.
- The blood supply to the plexus is from the posterior inferior cerebellar arteries.
- The function of the choroid plexus is to produce cerebrospinal fluid.



Central Canal of the Spinal Cord and Medulla Oblongata

Central canal opens superiorly into the fourth ventricle.

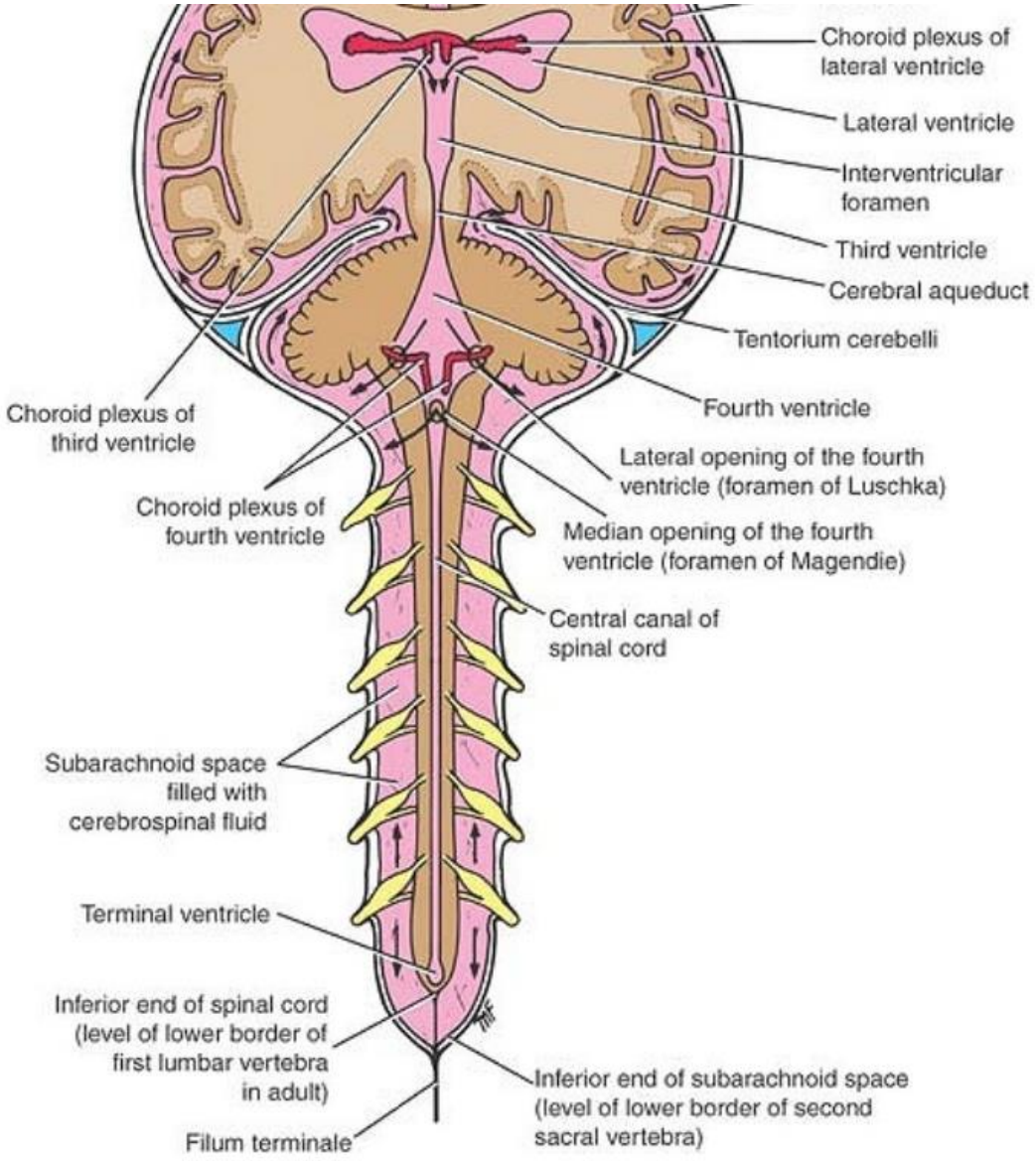
Inferiorly, it extends through the inferior half of the medulla oblongata and through the entire length of the spinal cord.



Central Canal of the Spinal Cord and Medulla Oblongata

In the conus medullaris of the spinal cord

- It expands to form the terminal ventricle .
- Central canal is closed at its lower end, is filled with cerebrospinal fluid, and is lined with ependyma.
- There is no choroid plexus in the central canal.




Thank you!