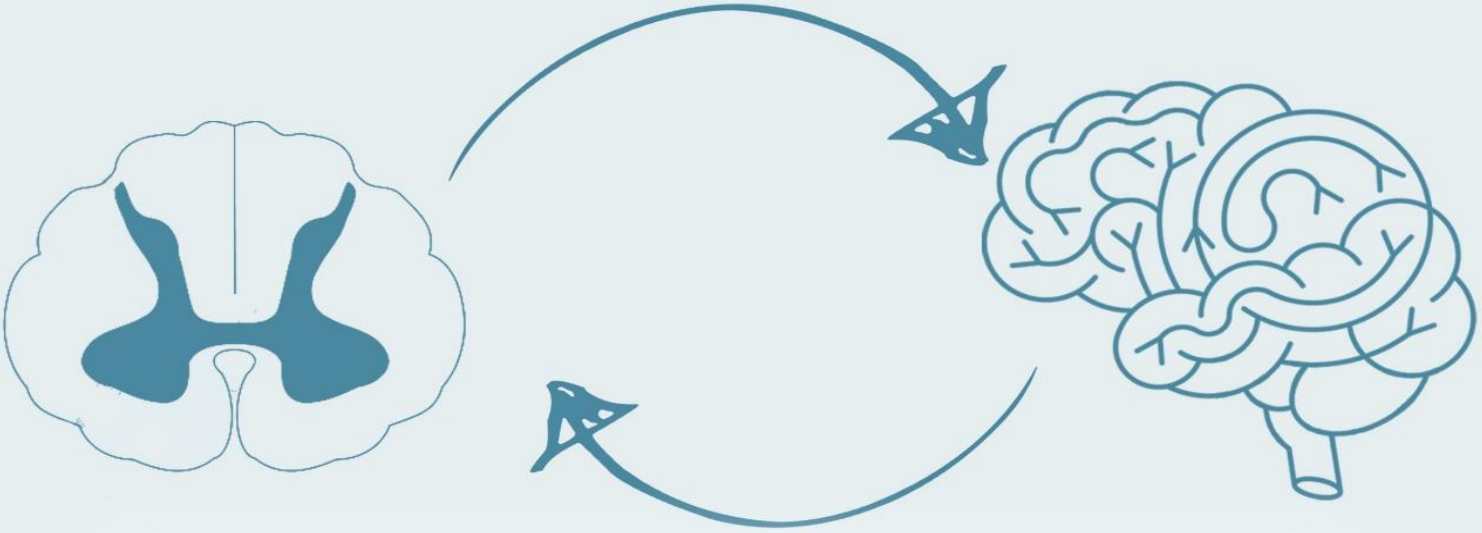

CNS

Anatomy

0 slides 0 sheets

number	16
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This sheet will discuss these topics:

- The 3rd and 4th ventricles.
- Subarachnoid cisterns.
- The cerebrospinal fluid (CSF) and lumbar puncture (LP)

This sheet covered the slides (25-37) from updated slide #3

❖ ***The third ventricle***

It is a narrow slit like cleft in the diencephalon between the two thalami (major part of diencephalon). Hypothalamic sulcus separates between thalamus above and hypothalamus below. This sulcus extends between the end of interventricular foramen and cerebral aqueduct. Figures 1&3

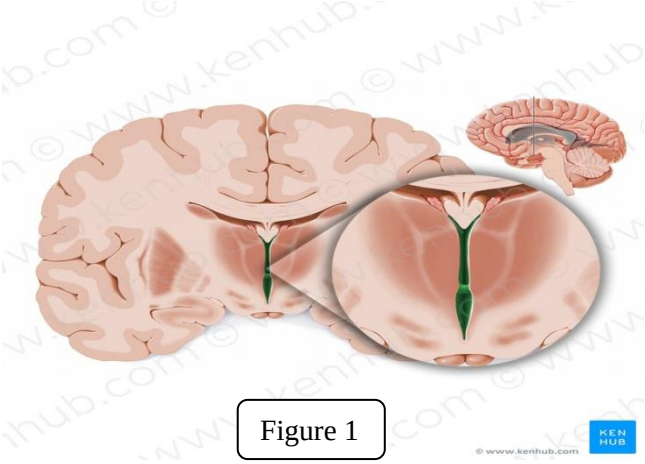


Figure 1

Boundaries:

See figures 2 & 3

Roof:

- ✓ Thin layer of ependyma stretched between lateral walls (two thalami) containing choroid plexus (1). As we know, ependyma is the cells which are lining the cavities of ventricles; the part of this ependyma which contains choroid plexus is forming the roof.
- ✓ More superiorly we will find the body of fornix, above it the septum pallicidum and most superiorly corpus callosum. See Figure 3

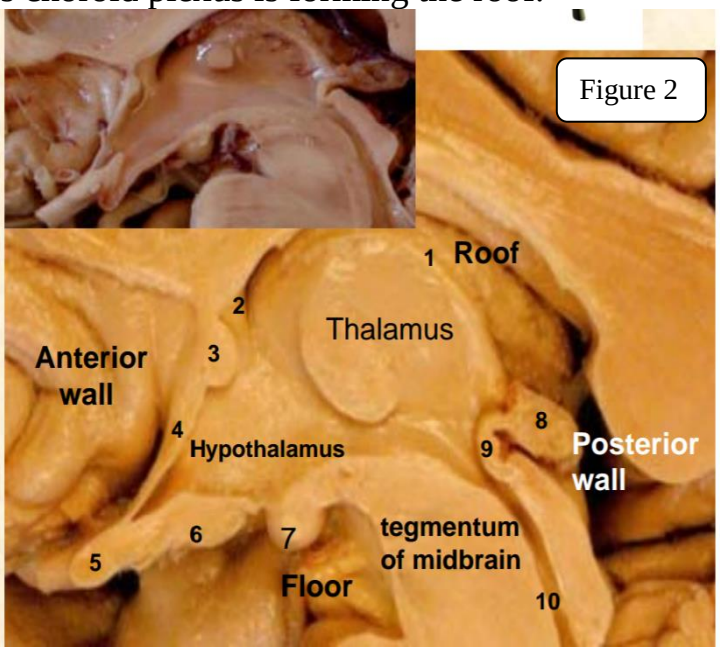


Figure 2

Anterior wall:

- ✓ Anterior column of fornix (2)
- ✓ Anterior commissure (3) (bellow and anterior to the column of fornix)
- ✓ Lamina terminalis (4): we called it "terminalis" because it's the terminal part of anterior wall of the 3rd ventricle. It connects between anterior commissure (3) and optic chiasm (5).

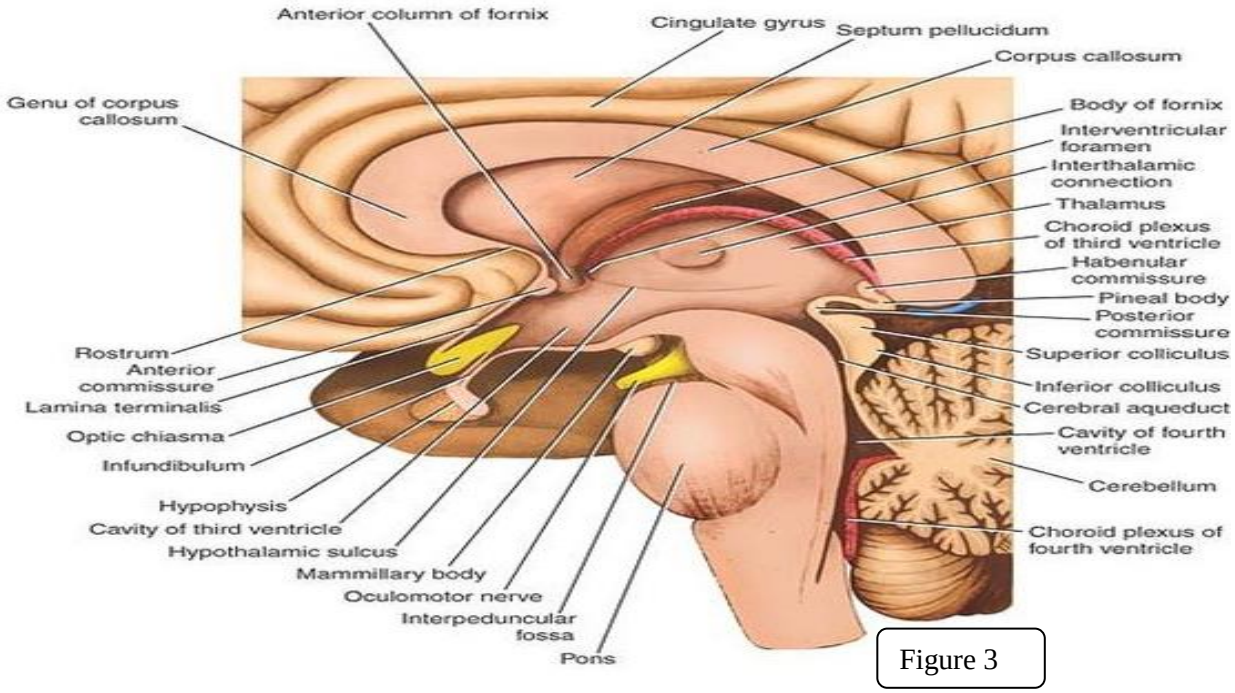


Figure 3

Floor:

- ✓ Optic chiasm (5): it is the decussation of optic nerve and after that go to lateral geniculate body through optic tract.
- ✓ Tuber cinereum (6) (median eminence is a small swelling in it): it is where the infundibulum starts (connects to pituitary gland inferiorly).
- ✓ Mammillary body (7)
    - o *Optic chiasm, median eminence and mammillary body are components of hypothalamus. We will talk about hypothalamus in next lectures.*
- ✓ Tegmentum of midbrain.

Posterior wall:

- ✓ Pineal body (8).
- ✓ Posterior commissure (9).
- ✓ Aqueduct of sylvius (10): the cavity of midbrain.

Lateral wall:

- ✓ Thalamus & hypothalamus.

There is no medial wall to the 3rd ventricle; it is a slit like structure.

Connections:

It is connected with the lateral ventricle through intervenricular foramen & with the 4th ventricle through cerebral aqueduct. Refer to figures 3&4

Recesses:

Figures 4 &5 illustrate the shadow of 3rd ventricle (green in color)

- ✓ *Optic recess:* inside the stem of chiasm.
- ✓ *Infundibular recess*: inside the stem of infundibulum.
- ✓ *Supra pineal recess:* above the pineal gland.
- ✓ *Pineal recess:* within the stalk of pineal gland

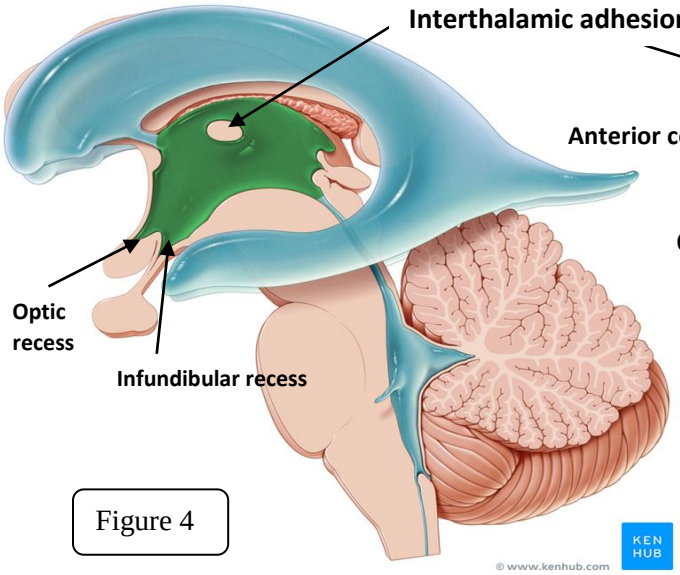


Figure 4

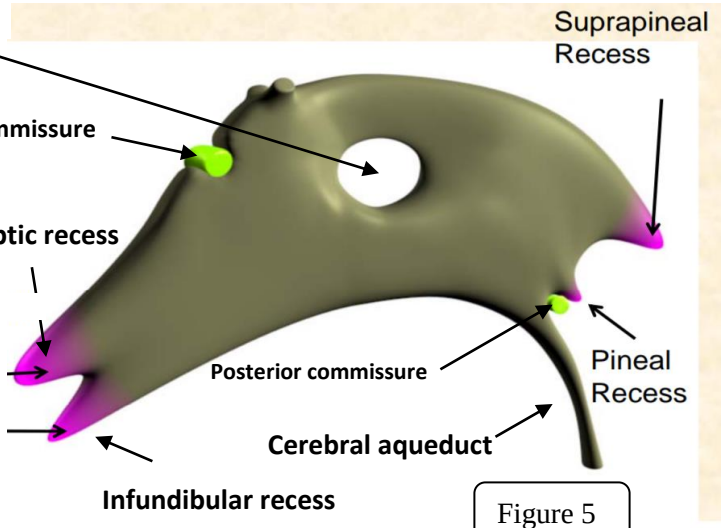
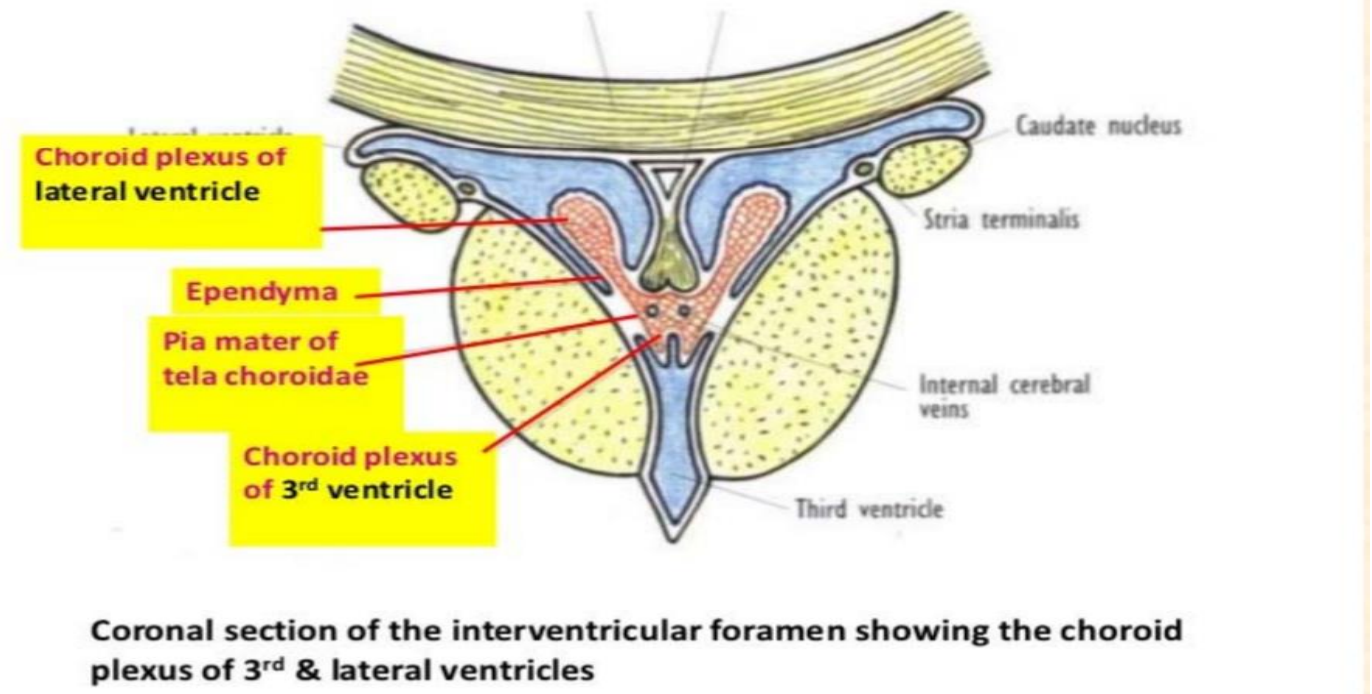


Figure 5

Choroid plexus of the 3rd ventricle:

It is Formed of tela choroidea above the roof of the ventricle. What is tela choroidea? It is composed of capillaries from blood supply of the brain, surrounded by double layer of pia mater. See figure 6

The **tela choroidea** is a region of meningeal pia mater and underlying ependyma that gives rise to the choroid plexus in each of the brain's four ventricles. *Tela* is Latin for *woven* and is used to describe a web-like membrane or layer.The tela choroidea is a very thin part of the loose connective tissue of pia mater that overlies and closely adheres to the ependyma with no intervening tissue. It has a rich blood supply. The ependyma and vascular pia mater that make up the tela choroidea form regions of minute projections known as a choroid plexus that projects into each ventricle.***Wikipedia.***



Coronal section of the interventricular foramen showing the choroid plexus of 3rd & lateral ventricles

Figure 6

It is very important to know the location of choroid plexus in each ventricle:

- In lateral ventricle: it is located in the medial wall (return to the previous sheet for details).
- In 3rd and 4th ventricles: it is located in the roof.

The second important thing is to know which artery is forming the plexus:

- In lateral and 3rd ventricle: posterior choroidal artery, a branch from posterior cerebral artery, which is the terminal branch of basilar artery. And anterior choroidal artery (branch of ICA)
- In 4th ventricle: posterior inferior cerebellar artery, a branch from vertebral artery (we will talk about it later in this sheet).

Venous drainage of the 3rd ventricle: from slides; they weren't mentioned by the Doctor.

- Internal cerebral veins; they unite to form great cerebral vein.
- Inferior sagittal sinus & straight sinus.

❖ ***The fourth ventricle***

It is a rhomboid shape cavity, lies between the anterior surface of cerebellum and the back of pons & upper part of medulla (opened medulla).

Figure 7: sagittal section in 4th ventricle; we separate two cerebellar hemispheres and what we see from cerebellum is the vermis "connecting fibers between the two hemispheres"

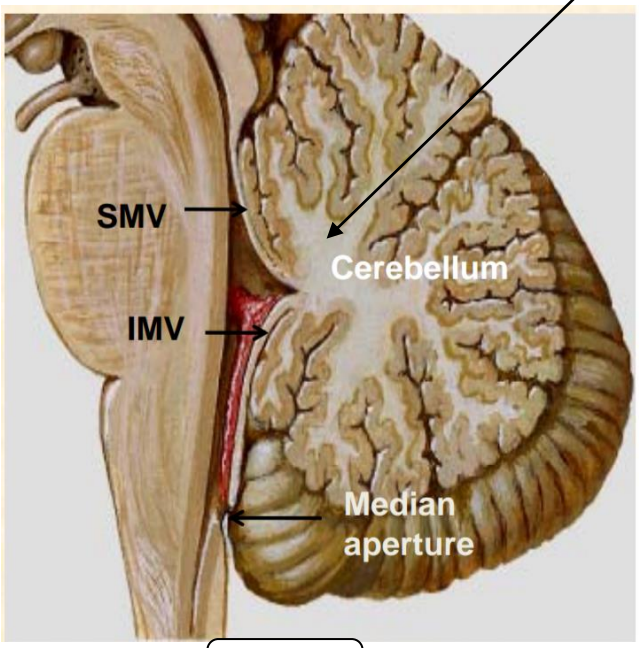


Figure 7

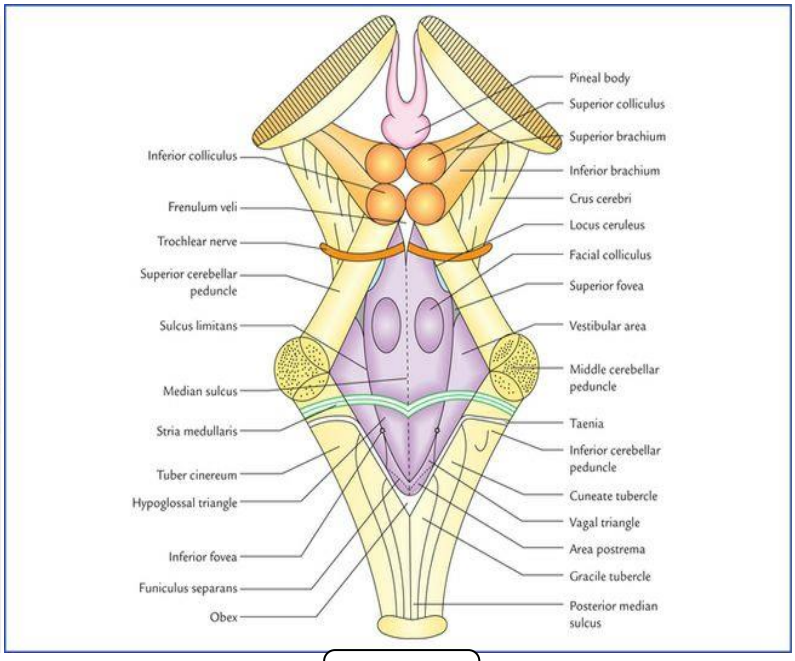


Figure 8

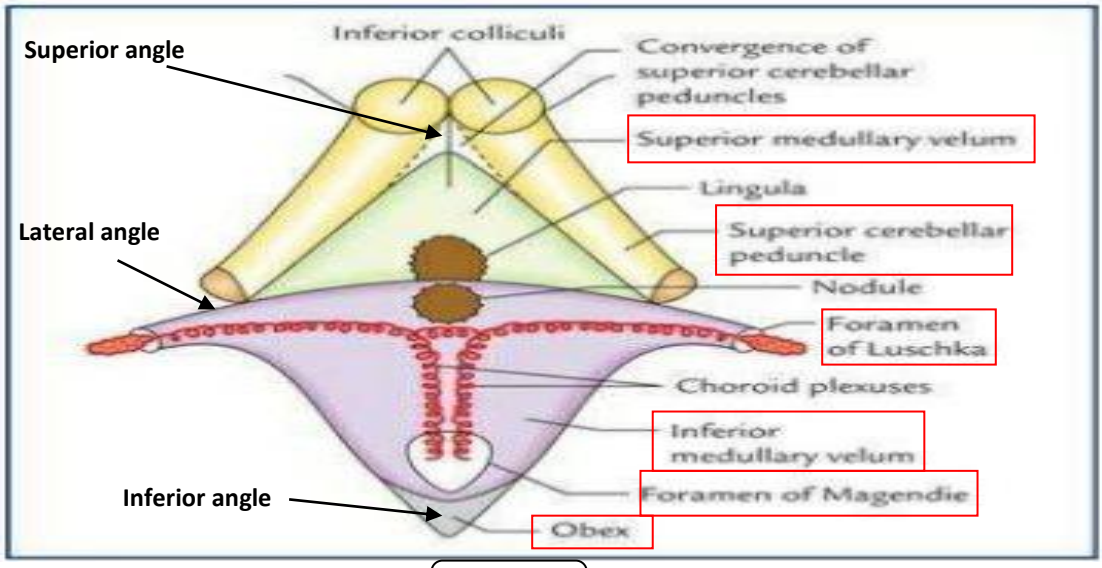


Figure 9

It has 4 angles:

Please keep looking at figures 8&9 as we proceed.

- ✓ *Superior angle*: is continuous with the cerebral aqueduct of midbrain.
- ✓ *Inferior angle*: is continuous with the central canal of closed medulla (at the obex)
- ✓ *Two lateral angles and recesses* (one in each side): they lie between the concourse التقاء of superior cerebellar peduncle (SCP) and inferior cerebellar peduncle(ICP) on each side.

Remember: SCP connects cerebellum and midbrain & ICP connects cerebellum and medulla.

Floor:

- ✓ Pons and upper medulla.

Roof: is tent shape and formed of:

- ✓ The convergence of two SCPs and two inferior cerebellar peduncles
- ✓ The superior medullary velum غشاء (SMV): it is an ependymal layer lies between the two SCPs (bridges the triangular gap between the two peduncles).
- ✓ The inferior medullary velum (IMV): like SMV it bridges the gap between the two ICPs.
- ✓ Cerebellum: it is the outer most roof and posterior wall, which covers all the previous structures.

Foramens:

- ✓ Two **L**ateral foramens of **L**ushka: they are openings in each lateral recess (lateral angle) of the 4th ventricle (around ***flocculus***; don't worry about it right know, we will talk about it in details in sheet#9☺.If you want to see it refer to slide 29).
- ✓ One **M**edian foramen of **M**egendie: it is an opening in IMV (around the convergence of ICPs before the central canal).
    - Importance of these foramens: they facilitate the escape of the CSF from the 4th ventricle to subarachnoid space around the brain, cerebellum and spinal cord.

Choroid plexus of the 4th ventricle:

Refer to figures 7&9

- ✓ It is like T shape
- ✓ It starts from ICPs and enters the IMV (the stem of T) and the right and left extensions go to right and left lateral angles. **In other words**, it starts from foramen of Megendie and goes to the two lateral foramens of Lushka.
- ✓ It's formed from **posterior inferior cerebellar artery (PICA),** a branch of vertebral artery.

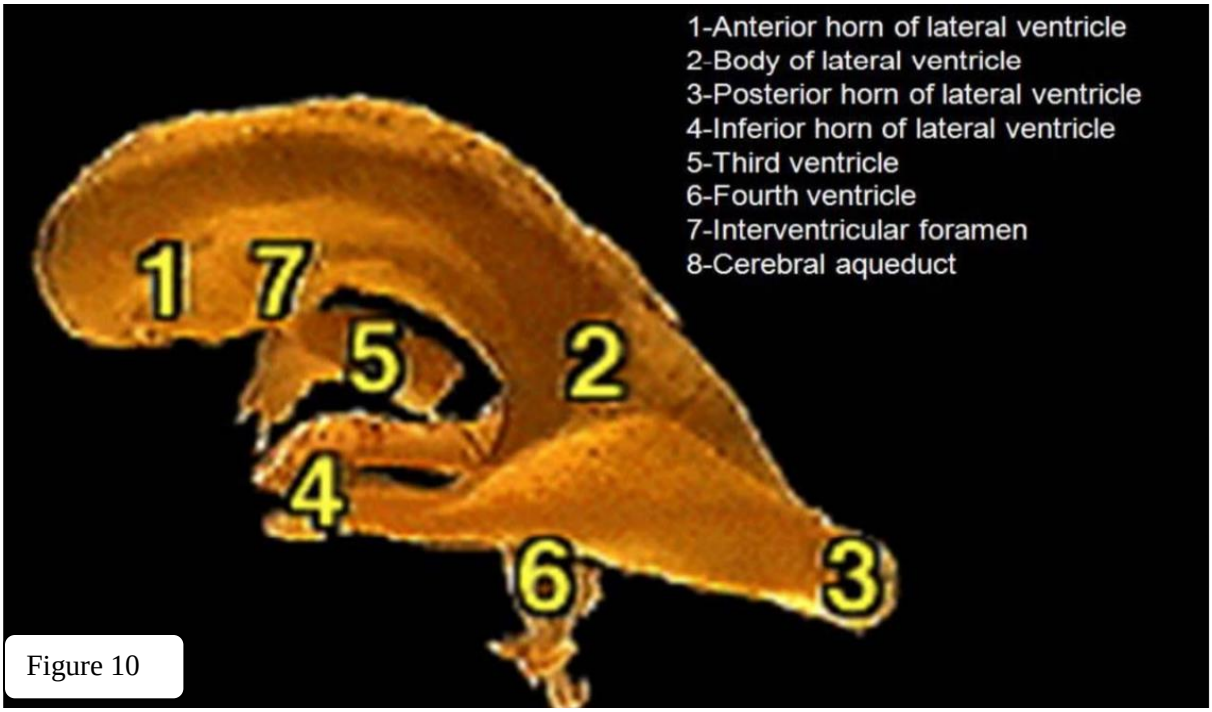


Figure 10

Please note that number 2 in figure 10 is the trigone: the part of the body at the junction of inferior and posterior horns contains the glomus (choroid plexus tuft) which is calcified in adult after the age of 40.

We've finished the ventricles.

❖ ***Subarachnoid cisterns***

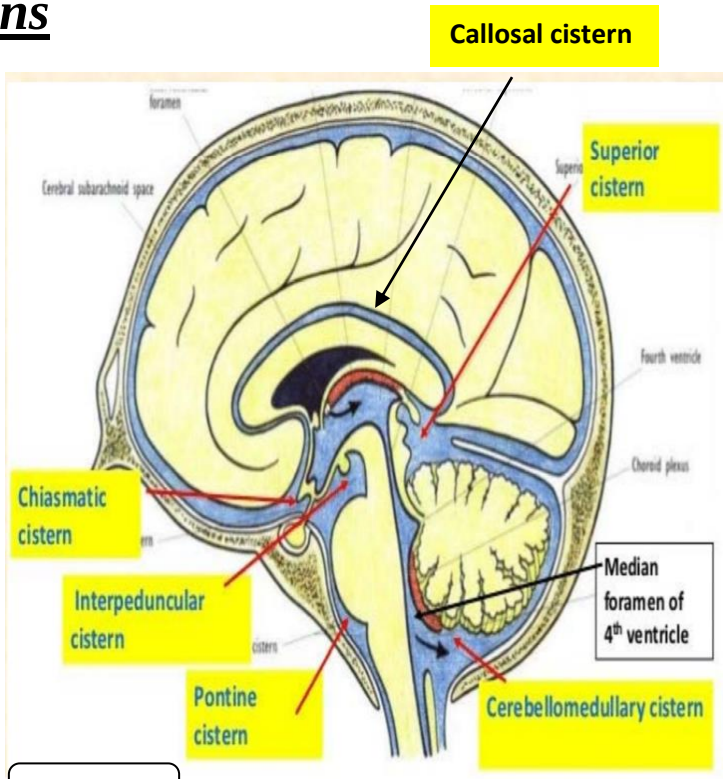


Figure 11

They are dilatations in subarachnoid space (SAS), which are filled with CSF, in certain areas to protect important structures underlying them. Figure 11

Lumbar cistern: do you remember when we talked about terminal ventricle in Lab #1? It is the extension of the central canal inside the conus medullaris which is the terminal part of the spinal cord. Around this area there is a dilatation in SAS called Lumbar cistern. Figure 14 at the end of the sheet.

Cerebello-medullary cistern (cisterna magna العظيم): it lies between the cerebellum and back of medulla and receives the CSF through foramen of Megendie. It protects vital centers in medulla (respiratory & cardiac centers).

Ponto-medullary cistern: it lies in front of pons and medulla and receives the CSF through foramens of lushka. It protects basilar & vertebral arteries.
It is transversed by roots of lower 8th cranial nerves (from slides).

Interpeduncular cistern: it lies over interpeduncular fossa (it is an area located at the base of the brain, bounded posterolaterally by cerebral peduncles & anterolaterally by optic chiasm and tract. Contents of it are mammillary body, posterior perforated substance & oculomotor nerve; we talked about it in Lab #1). The importance of this area is that it contains circle of Willis (it's the communication between vertebrobasilar system and carotid system), so that this cistern protect this circle.

Cistern of lateral fissure: contains the middle cerebral vessels.

Callosal cistern: lies above corpus callosum & contains anterior cerebral vessels.

Chiasmatic cistern: lies around optic chiasm to protect it.

❖ ***The cerebrospinal fluid (CSF)***

It is the fluid filling the ventricles & central canals of the CNS and subarachnoid spaces around brain and spinal cord. Figure 12

Production of CSF: It is secreted by the **choroid plexuses** in the medial wall of the lateral ventricles & the roof of the 3rd & 4th ventricles, but the major source is the lateral ventricles because they are the biggest ones.

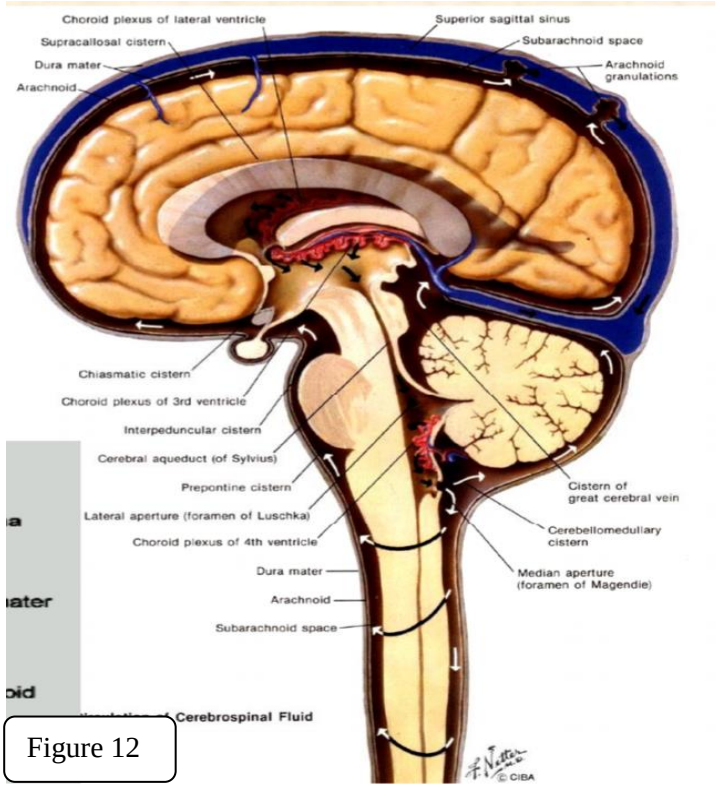


Figure 12

Circulation of CSF: It leaves the lateral ventricle through interventricular foramen (Monro) to the 3rd ventricle then to the 4th ventricle through cerebral aqueduct of midbrain & leaves the 4th ventricle through its 3 apertures to the subarachnoid space forming a water cushion to protect the brain & spinal cord.

Apsorbtion of CSF: it must be absorbed to prevent the increase in intracranial pressure; this drainage is done by arachnoids' villi & granulations. They are finger like projections from SAS inside the superior sagittal sinus (located at the upper border of falx cerebri).so they pour تصب CSF inside the superior sagittal sinus then to venous circulation. Figure 13

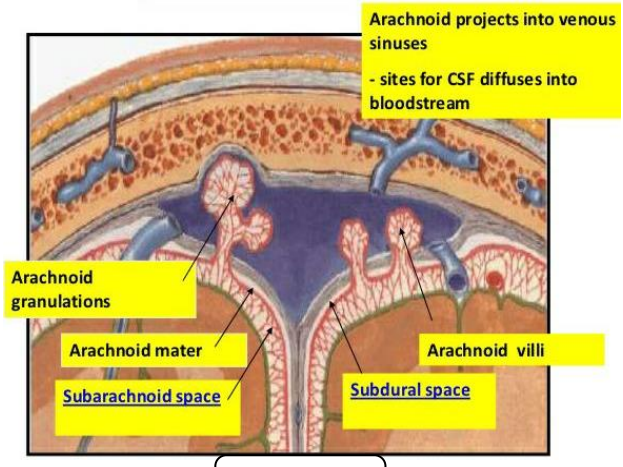


Figure 13

The choroid plexuses produce roughly 550 ml per day (rate of production) this fluid is constantly reabsorbed, so that only 150 ml (normal amount; varies between 100-200ml) is found at any one time. Total CSF volume (150 ml) is turned over at a rate of three times a day.

Please return to slide 33 in slide #3 (properties & functions of CSF)

❖ ***Lumbar puncture***

Procedure by which CSF is taken out from the subarchnoid space.CSF is drawn by introducing a needle between the 3rd and 4th lumbar vertebrae or between 4th and 5th in case of children (supracristal line), because the spinal cord terminates at lower border of L1 & subarachnoid space is wider (lumbar cistern; oval shape in figure 14)

Purpose of Lumbar puncture:

- For diagnostic purposes.
- Spinal anesthesia.
- To measure CSF pressure.

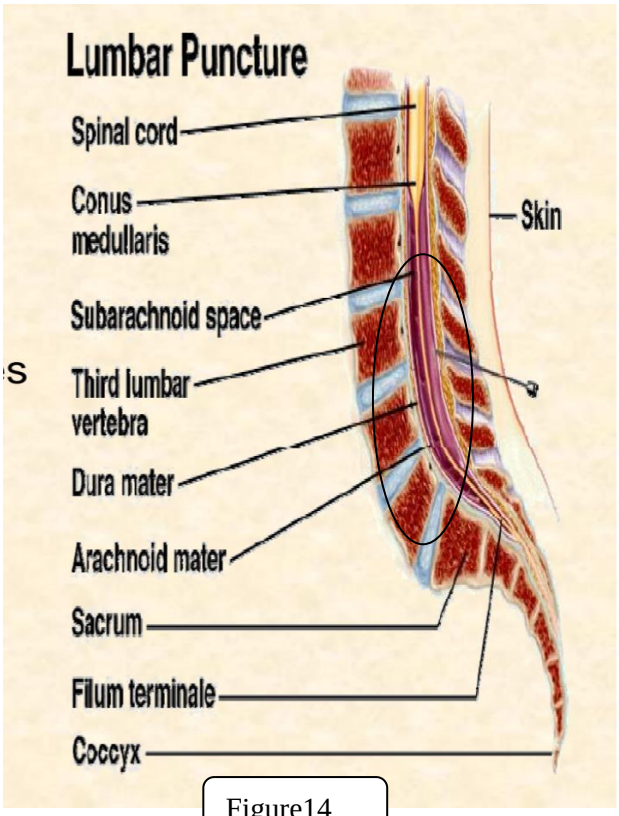


Figure14

Note that the slides from 38 to 44 (in updated slide #3) and from 30 to 36 (old slide #3) are not included in the exam; just for reading ☺

However, you must know the clinical condition which is resulted from increased production or decreased absorption of the CSF which is called (hydrocephalus).

Also we have a very important clinical manifestation of the increased intracranial pressure which is papilledema around optic nerve. Please refer to the slides for more information.

Thank you and good luck