

The CNS contains a system of CSF-filled interconnected cavities that are communicating with the CSF in the subarachnoid space around the CNS. This ventricular system originates from the cavity of the neural tube that have grown with the growth of the brain & spinal cord.

The ventricular system consists of 2 lateral ventricles (the cavities of cerebral hemispheres), connected to the third ventricle (the cavity of diencephalon) via the interventricular foramina of Monro. The 3rd ventricle is connected to the fourth ventricle (the cavity of the hindbrain) via the cerebral aqueduct of Sylvius (the cavity of the midbrain). The 4th ventricle is connected to the subarachnoid space via one midline & two lateral foramina, & is continuous inferiorly with the central canal of the medulla oblongata, which is in turn continuous with the central canal of the spinal cord, which is closed at its lower end.

The brain ventricles contain special structures called the "choroid plexuses", that secrete the CSF into the ventricles by filtrating the blood plasma. CSF is then drained into the venous system via the intracranial venous sinuses.

The Lateral ventricles

The paired lateral ventricles are the largest, being situated in the cerebral hemispheres. The lateral ventricle resembles a large flattened C shape with a posterior extension. The lateral ventricle consists of anterior horn, body, posterior, & inferior horns. The body, posterior horn & inferior horn are connected to each other by the collateral trigon of the ventricle. The anterior horn & the body of the lateral ventricle are very close to the midline, while the collateral trigon, posterior & inferior horns are shifted laterally.

The anterior horn:

The anterior horn of the lateral ventricle lies in the white matter of the frontal lobe. It has a roof, anterior wall, medial wall, & a floor. The anterior horn is separated from the body of lateral ventricle by a perpendicular plane passing through the interventricular foramen. See table-1 for the boundaries of the anterior horn:

| Table-1 | Boundary | Structure | Description |
|---------|---------------|-----------------------------------|---|
| | Anterior wall | Genu & rostrum of corpus callosum | The sloping inner surface of the genu & rostrum of corpus callosum. |
| | Roof | Body of corpus callosum | The under surface of the anterior part of the body of corpus callosum. |
| | Medial wall | Septum pellucidum | A midline double layer of nervous tissue, with a slit-like cavity in between. |
| | Floor | Head of caudate nucleus | The convex surface of the head of caudate nucleus forms the inferolateral wall (floor) of the anterior horn, making an acute angle with the roof. |

The body:

The body of the lateral ventricle extends anteroposteriorly from the level of interventricular foramen to the splenium of corpus callosum. It lies within the white matter of the frontal & parietal lobes. It is triangular in coronal section, having a roof, medial wall, & inferolateral wall (floor), detailed in table-2.

| Table-2 | Boundary | Structure | Description |
|---------|-------------|---|--|
| | Roof | Body of corpus callosum | The under surface of the posterior part of the body of corpus callosum. |
| | Medial wall | Septum pellucidum, column of fornix | The septum pellucidum is attached to the body of corpus callosum superiorly, & to the body of fornix inferiorly, so that the fornix makes the lowermost part of the medial wall. |
| | Floor | Choroid fissure & plexus, thalamus, stria terminalis, thalamostriate vein, & caudate nucleus. | The choroid fissure separates the medial wall from the floor of the body, being filled with the choroid plexus. Just lateral to the fissure, the dorsal surface of thalamus lies, then comes the dorsal surface of the body & tail of caudate nucleus, with a groove between them that contains the stria terminalis & thalamostriate vein . |

The posterior horn:

The posterior horn of the lateral ventricle lies within the white matter of the occipital lobe. It passes posteriorly then medially to taper by fusion of its walls. It has a roof, lateral wall & medial wall, detailed in table-3.

| Table-3 | Boundary | Structure | Description |
|---------|---------------------|-------------------------------------|--|
| | Roof & lateral wall | Tapetum of corpus callosum | From the body & splenium of corpus callosum, a layer of fibers (the tapetum) spread laterally & downwards, making the concave roof & lateral wall of the posterior horn. |
| | Medial wall | Bulb of posterior horn, calcar avis | The medial wall is formed by 2 bulges: the upper bulge (bulb of posterior horn) is made by the fibers of the splenium of corpus callosum as they pass posterolaterally into the occipital lobe. The lower bulge (calcar avis) is produced by the deep calcarine sulcus beneath it. |

The inferior horn:

The inferior horn is the largest compartment in the lateral ventricle. It begins at the collateral trigon, & extends laterally, inferiorly & anteriorly in the white matter of the temporal lobe, in line with the superior temporal sulcus, to end near the amygdaloid body. In coronal section, the inferior horn resembles a curved slit with a superolateral convexity. So, the inferior horn has a roof (superolaterally) & a floor (inferomedially), detailed in table-4.

| Table-4 | Boundary | Structure | Description |
|---------|-------------------------------|---|---|
| | Roof (superiorly & laterally) | Tapetum of corpus callosum, tail of caudate nucleus, stria terminalis | As in the posterior horn, fibers of the tapetum continue to make the roof of the inferior horn, with the tail of caudate nucleus & stria terminalis forming the medial part of the roof. |
| | Floor (inferiorly & medially) | Choroid fissure & plexus, fimbria, hippocampus, & collateral eminence | From medial to lateral, the floor of the inferior horn is formed by: the choroid fissure & plexus, fimbria of hippocampus, the hippocampus, & the collateral eminence (produced by the underlying collateral sulcus). |

The collateral trigon: this is the triangular part of the lateral ventricle where the body, posterior horn, & inferior horn meet. Its floor is made by the collateral eminence & hippocampus, & its roof is made by the tapetum. The choroid plexuses of the inferior horn becomes continuous with that of the body via the collateral trigon.

The Third Ventricle

The 3rd ventricle is a midline slit-like cavity within the diencephalon. It is connected to the lateral ventricles anterosuperolaterally, & to the cerebral aqueduct posteroinferiorly. The 3rd ventricle has 6 boundaries: a roof, a floor, an anterior wall, a posterior wall, & 2 lateral walls.

Lateral wall: the largest boundary, it is formed by the medial surface of the anterior 2/3rd of thalamus above (with the interthalamic adhesion connecting the 2 lateral walls), the hypothalamus below & anteriorly, & the subthalamus below & posteriorly. The hypothalamic sulcus is seen on the lateral wall as a curved groove extending from the cerebral aqueduct to the interventricular foramen, separating the thalamus (above) from the hypothalamus (below).

Anterior wall: this is formed mainly by the lamina terminalis, which is a thin membrane that extends vertically from the rostrum of corpus callosum to the optic chiasma. The anterior commissure is a horizontal band of fibers that crosses the midline & exists on the upper part of the anterior wall on the posterior surface of lamina terminalis. Just lateral to this, the 2 columns of fornices make the anterior wall.

Floor: anteriorly, the floor of the 3rd ventricle is formed by the optic chiasma, separated from the lamina terminalis by the optic recess. Just posterior to the chiasma, the floor is formed by the infundibulum, with the infundibular recess passing into its base. Posterior to this, the floor is formed by the tuber cinereum & mamillary bodies, then by the posterior perforated substance & the rostral surface of the midbrain tegmentum. The floor extends posteriorly to the opening of the cerebral aqueduct.

The **roof** of the third ventricle is a thin ependymal layer that extends from its lateral walls to the choroid plexus, which spans the choroid fissure, with the body of fornix lying above it. The choroid plexus of the 3rd ventricle is formed by 2 parallel elongated bands that span the roof from the interventricular foramina (where they are continuous with the

choroid plexuses of the lateral ventricles) to the posterosuperior angle of the ventricle, where it ends below the splenium of corpus callosum.

The **posterior wall** of the 3rd ventricle is formed by a suprapineal recess above the pineal gland, by a pineal (epiphyseal) recess that extends into the pineal stalk and by the posterior commissure. Below the commissure, the ventricle is continuous with the cerebral aqueduct of the midbrain.

The Forth ventricle

The 4th ventricle is the cavity of the hindbrain. It is a tent-like space situated between the pons & medulla oblongata (anteriorly) & the cerebellum (posteriorly). It is continuous rostrally with the cerebral aqueduct & caudally with the central canal of medulla oblongata. The 4th ventricle has a roof & an apex directed posteriorly into the white matter of the cerebellum, & a diamond-shaped base anteriorly, made by the dorsal surfaces of the pons & upper medulla.

The **roof** of the fourth ventricle is formed by the superior and inferior medullary veli (singular: velum). The superior medullary velum is a thin sheet of tissue stretches across the ventricle between the superior cerebellar peduncles, & is continuous with the cerebellar white matter. The inferior medullary velum is composed of a thin sheet of pia mater lined with ependyma. A large median aperture (foramen of Magendie) is present in the inferior medullary velum just inferior to the nodule of the cerebellum. In addition, the 4th ventricle has 2 lateral recesses that extend to the lateral aspect of the pontomedullary junction, where the 2 lateral apertures (foramina of Luschka) exist. CSF flows from the ventricle through the 3 foramina into the subarachnoid space. The choroid plexus of the 4th ventricle is a T-shape structure with 2 vertical bands, attached to the inner surface of the inferior medullary velum.

The **floor** of the fourth ventricle is a shallow diamond-shaped or rhomboidal depression (rhomboid fossa) on the dorsal surfaces of the pons and the rostral half of the medulla. It consists largely of grey matter and contains important cranial nerve nuclei.

- The superior part of the ventricular floor (dorsum of the pons) is triangular in shape and is limited laterally by the superior cerebellar peduncles as they converge toward the cerebral aqueduct.
- The inferior part of the ventricular floor is also triangular in shape. It is bounded caudally by the gracile and cuneate tubercles which contain the dorsal column nuclei, and more rostrally by the diverging inferior cerebellar peduncles.
- A longitudinal median sulcus divides the floor of the fourth ventricle. Each half is itself divided, by the sulcus limitans, into a medial region (the medial eminence) and a lateral region (the vestibular area). The vestibular nuclei lie beneath the vestibular area.
- In the superior part of the ventricular floor, the medial eminence is represented by the facial colliculus, a small elevation produced by the underlying facial nerve fibers looping around the nucleus of abducent nerve.
- Inferior to the facial colliculus, at the level of the lateral recess of the ventricle, a group of nerve fiber fascicles, known as the striae medullaris, runs transversely across the ventricular floor and passes into the median sulcus.
- In the inferior half of the floor, the medial eminence is represented by the hypoglossal triangle (trigone), which lies over the hypoglossal nucleus.
- Between the hypoglossal triangle and the vestibular area, is the vagal triangle (trigone), which covers the dorsal vagal nucleus.

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