{Important Notes}

***visual association Cortex lesion →**Visual agnosia: able to see but unable to understand.

***Lateral to medial:** Posterior ramus of the lateral fissure → Insula → lentiform nucleus → Thalamus → 3rd ventricle

*The Basal nuclei:

-Caudate nucleus: comma shaped, composed of:

Head: attached to the anterior past of the lentiform nucleus

Tail: contains amygdala

amygdala: smell centre locates in the uncus at the anterior past of the Para hippocampal gyrus

-lentiform nucleus (lateral putamen and medial Globus pallidus (external & internal).

*The interpeduncular fossa:

Boundaries:

Anterior: optic chiasma, posterior: Pons, anterolateral: optic tract and crura cerebri

contents: -mamillary body -posterior perforated substance -oculomotor never (emerges from the medial aspect of the crus cerebri) -tuber cinereum and infundibulum.

*The pituitary gland is suspended in the interpeduncular fossa by the in infundibulum "so it's not considered as a content in the fossa"

***the internal capsule:** V-shaped fibres is located between the lentiform and caudate nuclei anteriorly and lentiform and thalamus posteriorly, composed of:

Anterior limb, Genu, posterior limb, retro lentiform (connects the lateral geniculate body with primary visual cortex in the occipital lobe) and sub lentiform.

*Horizontal section:

-at least 4 parts of the internal capsule are visible.

-the cut begins at the frontal pole towards the occipital pole.

-frontal and occipital lobes appear in the same horizontal section, in contrast to the coronal section that show one of them only in the same section.

Forceps minor: Frontal radiation of the genu Corpus callosum.

Forceps major: occipital radiation of the splenium of corpus callosum.

#Nucleus accumbence: The pleasure centre that forms the anterior part of the caudate and lentiform nuclei, when stimulated it causes euphoria.

Striatum that receives the afferent fibresis made by caudate, putamen nuclei and caudate-lentiform bridges, While the efferent fibres originate from the Globus pallidus.

Ventricles: Lateral, 3rd and 4th ventricles.

Lateral ventricle: one in each hemisphere, made by septum lucidum and fornix medially, corpus callosum above, composed of:

part	floor	roof	lateral wall	Medial wall
Anterior horn	head of caudate	genu of corpus callosum	head of caudate	rostrum of corpus callosum, septum lucidum and the anterior column of the fornix
Body	: body of caudate	corpus callosum		fornix and septum lucidum
posterior horn		The teptum of the corpus callosum		bulb of splenium of the corpus callosum
inferior horn	Hippocampus anteriorly and collateral imminence made by the collateral sulcus posteriorly	tail of caudate and amygdala + the teptum of corpus callosum		

Trigon: between the body, the posterior horn and the inferior horn of the lateral ventricle, contains the choroid plexus.

Calcar avis: impression in the medial wall of the posterior horn made by the calcarine sulcus

interventricular foramen: communicates the lateral ventricle with 3rd ventricle, exists between the anterior column of fornix anteriorly and the Thalamus posteriorly.

*The choroid plexus*is made of Tela Choroidea(aka the blood CSF barrier: a double layer of the pia matter, and covered by ependymal cells)and is located between the fornix and the Thalamus in the choroid fissure in the floor of the lateral ventricle and it's made by the anterior and posterior choroidal arteries.

The 3rd ventricle: the cavity of the diencephalon

Boundaries:

Lateral wall: Thalamus and hypothalamus

Roof: inferior to superior: choroid fissure →fornix → septum lucidum→corpus callosum

Floor: optic chiasma (decussation of left and right optic nerves) -tuber cinereum -mammillary body -tegmentum (the ventral part of the midbrain)

Anterior: anterior commissural fibres(connects the right and left temporal lobes), anterior column of fornix, lamina terminalis(the terminal part of the anterior wall,connects the optic chiasm with the anterior commissural)

Posterior: pineal body (above it there is the habenular commissure), posterior commissure, cerebral aqueduct (sylvius)

There's no medial wall

Fornix is formed form the Hippocampus then goes superiorly to the thalamus, it then forms the anterior column until it reaches the mammillary body.

Hypothalamus that is responsible for hunger and angeris connected structurally and functionally to the hippocampus (and other parts of the limbic system)that is related to memory so that this connection is responsible for memory associated with smell.

Hippocampal commissure (aka fornix commissure): lies between crura of both ventricles

The mammillary body: hypothalamic nucleus that is located in the interpeduncular fossa in the inferior surface of the brain.

the septum lucidum connects the corpus callosum with the fornix

Communications of the 3rd ventricle:

1.Interventricular foramen: with the lateral ventricle.

2.Cerebral aqueduct: with the 4th ventricle.

Recesses: (small cavities filled with CSF) of the 3rd ventricle: -optic -infundibular -suprapineal -pineal (within the stalk)

Interthalamic adhesion: connection between two thalami doesn't contain CSF.

The Choroid plexus of the 3rd ventricle: located in the roof and it's made by the posterior choroidal artery.

The 4th ventricle: diamond shaped, has 4 angles: 2 laterally (connected with the subarachnoid space by foramina of Luschka), 1 superiorly (connected by the cerebral aqueduct with the 3rd ventricle) and 1 inferiorly (foreman of Magendi is located in the roof and is connected with the subarachnoid space of the spinal canal).

Relations:

Posteriorly (roof): cerebellum, superior (curtain stretched between superior peduncles) and inferior medullary velums (curtain stretched between inferior peduncles).

Anteriorly (floor): pones and the upper opened half of medulla.

The lateral wall is made by the superior and inferior peduncles.

Connections between the brainstem and cerebellum:

Superior cerebellar peduncles: with the midbrain

Middle cerebellar peduncles: with the pones, can't be seen in sagittal section.

Inferior cerebellar peduncles: with the medulla

cerebral peduncles are fibres located in the interpeduncular fossa connects the brain to the midbrain.

The origins of the cranial nerves:

The 1st and 2nd cranial nerves originate from the cerebrum. (extra note)

3rd and 4th: from the midbrain

5th, 6th, 7th and 8th: from the pones

9th,10th,11th and 12th: from the medulla

*The 4th trochlear nerve is the only nerve that can be seen from the posterior of the midbrain

The choroid plexus of the 4th ventricle:

Enters from foramen of Magendi, forms T shape, then it goes to lateral angles. It's suspended from the inferior half of the roof. It's made by the posterior inferior cerebellar (vertebral) arteries.

CSF (cerebrospinal fluid):

(By the doctor): The Cerebrospinal Fluid (CSF) is the fluid filling the ventricles & central canals of the CNS and subarachnoid spaces around brain and spinal cord.
(By Wikipedia): A clear colourless body fluid found in the brain and spinal cord, produced by the ependymal cells in the choroid plexus of the ventricles and absorbed by arachnoid granulations.

The more the need to protect a special area in the brain, the more the amount of CSF existing around it.

Such areas are *subarachnoid cisterns:*

1.Cerebro-medullary cisterna (cisterna magna): between cerebellum and the roof of the 4th ventricle. It protects the important centres located there (such as cardiac, respiratory and emetic centres).

2.Pontine (pontomedullary) cisterna: in front of pons and It protects the basilar and vertebral arteries that pass through it, it also receives the CSF through foramina of Luschka and its's transversed by the roots of the lower 8 cranial nerves.

3.Chiasmatic cisterna: around optic chiasma

4.Interpeduncular cisterna: over interpeduncular fossa, contains circle of Willis, transversed by the root of the 3rd and 4th cranial nerves.

5.Cisterna of the lateral fissure: in the lateral fissure, contains the middle cerebral vessels.

6.Callosal cisterna: on the medial side of the brain, above corpus callosum, contains the anterior cerebral vessels.

The Anterior cerebral vessels can be found in the callosal sulcus

the basilar artery is formed by the vertebral arteries at the upper border of the pons then it divides to form the right and left posterior cerebral arteries To supply the posterior aspect of the brain, thalamus, lateral and medial geniculate bodies.

CSF circulation: 3 times a day.

Lateral ventricle (leaves interventricular foreman)→ 3rd ventricle→ cerebral aqueduct→ 4thventricle→ foramina of Luschka and Magendi→ subarachnoid space→ (absorption by) subarachnoid granulations → superior sagittal sinus (in falx cerebri) →right transverse sinus → internal jugular vein.

The Blood brain barrier (BBB):

A barrier presents between the blood and brain, it exists in all areas of brain except hypothalamus, pineal gland and area posterem, consists of:

-astrocytes: covers the vessels by its foot processes to lessen the pores.

-blood vessels: endothelial cells with tight junctions and thick basement membrane.

Clinical applications regard the CSF:

1.Increased ICP by either increased production or decreased absorption has some manifestations:

-separated skull bones in the newborn since the sutures are not completely closed.

-hydrocephalus (CSF accumulation in brain) with: sunset eyes (depression of the eyes because of the compressing pressure on the oculomotor and trochlear nerves), projectile (without nausea) vomiting, seizures and other motor manifestations.

2. LB (lumber puncture): a procedure by witch a CSF sample is taken from the subarachnoid space by a needle inserted between the 3rd and 4th lumber vertebrae.

Purposes:

-infections such as meningitis (bacteria in CSF).

-subarachnoid haemorrhage (blood in CSF).

-Jaundice (xanthochromia: bilirubin in CSF).

- local anaesthesia such as caesarean section.

- CSF pressure measurement.

3.Papilledema: bulging of the optic disc as a result of retinal vein congestion because of increased ICP that can lead to optic atrophy and blindness.

the meninges are expanded to around the optic nerve (so the subarachnoid space too).

Cerebellum:

relations:

Superiorly: brain, separated from the brain by the tentorium cerebelli.

Anteriorly: brainstem

Surfaces: superior: facing midbrain and tentorium cerebelli. Inferior: consists of anterior and posterior parts.

Parts:

Two lateral hemispheres connected by middle vermis

Subdivisions:

-**Horizontal subdivision** (lobes):

*Anterior: anterior to the primary fissure, makes 1/3 of the superior surface

*Posterior: posterior to the primary fissure, makes 2/3 of the superior surface and most of the inferior surface.

*Flocculo-nodular: consists of flocculus and parafollicular nodule (part of vermis)

in the superior surface, the anterior and posterior lobes are visible only, while inferiorly all three lobes could be seen.

the parallel fold on the surface of cerebellum are called folia.

 # for full understanding of vertical and functional subdivisions, the scientists made an imaginary unfolded cerebellum that contains the 3 lobes.

Vertical subdivision:

1.Vermis: (the central part) is made from ant. & post. Lobes superiorly, anterior, posterior and flocculo-nodular lobes inferiorly, it represents the central part of the body and truncal/ axial muscles. The body is represented in down fashion. Connected to fastigial nucleus.

2.Paravermis: lateral to vermis, represents the upper and lower limb muscles, connected to Globose and emboliform nuclei.

3.Rest of lateral cerebellar hemispheres, connected to dentate nucleus.

Fissures:

1.Primary fissure: on superior surface, separates the anterior lobe form the superior lobe.

2.Horizontal fissure: starts from the anterior notch and goes horizontally around the cerebellum to end again at the anterior notch, it divides the cerebellum into upper and lower parts.

3.Posterolateral fissure: on inferior surface, separates the flocculo-nodular lobe form the rest of the cerebellum.

4.Retro tonsillar fissure: separates the tonsils from the rest of cerebellum.

cerebellar tonsils are located on either side of uvula of inferior vermis laying near the medulla oblongata in foramen magnum.

herniated cerebellar tonsils: cerebellar tonsils can herniate from the foramen magnum, when the intracranial pressure increases, which can compress the vital centres in the medulla oblongata.

Notches:

1.Anterior (midbrain) notch: occupied by the brainstem

2.Posterior (vallecula) notch: occupied by falx cerebelli.

The structure of cerebellum:

Cortex: consists of 3 layers:

1-outer molecular. Contains stellate and basket cells.

2-middle purkinje. Contains purkinje cells (the most important layer; contains inhibitory fibres to all cells)

3-inner granular. Contains the Gs (granular (the only excitatory cells) and Golgi cells)

Corpus Medullare(Arbor vitae: the tree of life): contains fibres (these fibres move through the cerebellar peduncles):

1-mossy: ends in granular then purkinje (afferent, indirect activation of purkinje)
2-climbing: ends directly in purkinje, afferent (direct activation of purkinje).

3-axons of purkinje: the only efferent (inhibitory) fibres that leave the cerebellar cortex and goes to deep medullary nuclei then projects to brainstem nuclei, thalamus and cerebral cortex.

Functional subdivisions:

1.Archicerebellum (Vestibulo-cerebellum):

Parts:Flocculo-Nodular Lobe + Lingual Lobule

Function:Vestibulo-Ocular Reflex (VOR:preserve the image on the centre of the visual field by producing eye movements in the direction opposite to head movements) and Equilibrium (well-developed in fish)

2.Paleocerebellum (Spino-cerebelllum):

Parts:Anterior lobe +midline vermis + paravermis

Function:regulating muscle tone of axial and proximal limb muscle, by receiving afferent proprioceptive impulses from muscles and tendons via Spino-cerebellar tracts.

3.Neocerebellum (Cerebro-cerebellum):

Parts: the rest of the cerebellar hemispheres + dentate nuclei.

Function:

-controls voluntary movements, coordinating and planning of sequence of intended movements.

-Regulation of force and time of Movement.

-Learning new complex movements: through Cortico-Ponto-cerebellar-Dentato-rubro (red nucleus of midbrain)-thalamo-cortical-spinal pathway

Cerebellar lesion syndromes:

*Ataxia: incoordination of movement, can result from:

Form the sheet: "The man most likely has a lesion in his paravermis (because he tries to control his movement with his limbs), but the young girl most likely has a lesion in vermis (because she cannot control her trunk)." **-I'm not sure** about this information but what I think that paravermal lesion coexists with inability to control the limbs since the paravermis controls the limb movement. "if you have any information regarding this please contact me ☺

*inability to touch your noses while closing your eyes can be a result of Cerebro-cerebellar lesion.

***A summary for the 4th, 5th an d 6th anatomy sheets.**

***I didn't include the pictures so refer to slides and sheets for more clarification.**

***I only reorganised the information in an easier way for fast memorization.**

***Sorry for any mistakes or missed notes though I tried my best to include everything is the sheets.**

Done By : Osama AL-Khader

"A mas is but the product of his thoughts; what he thinks, he becomes"

-Mahatma Gandhi