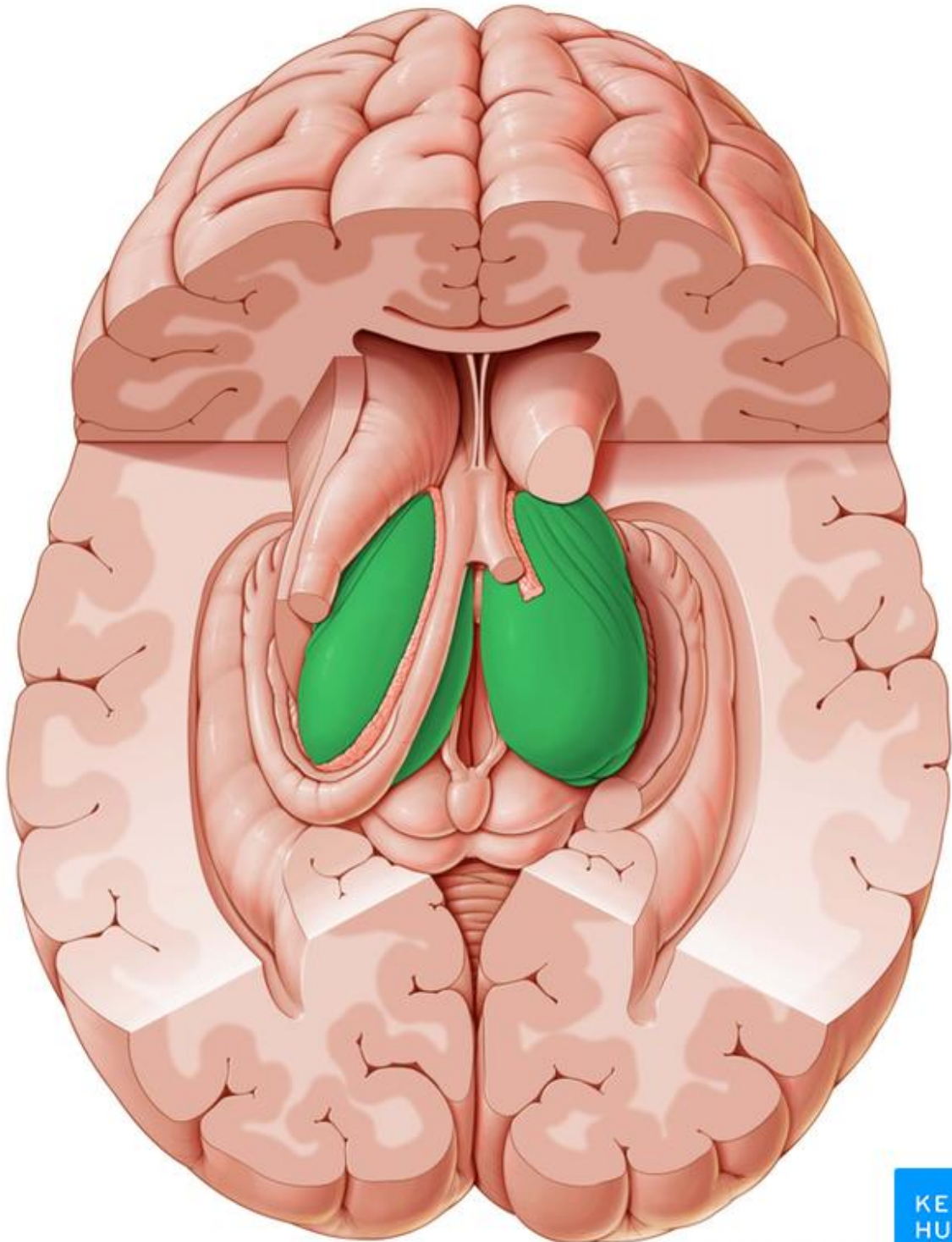
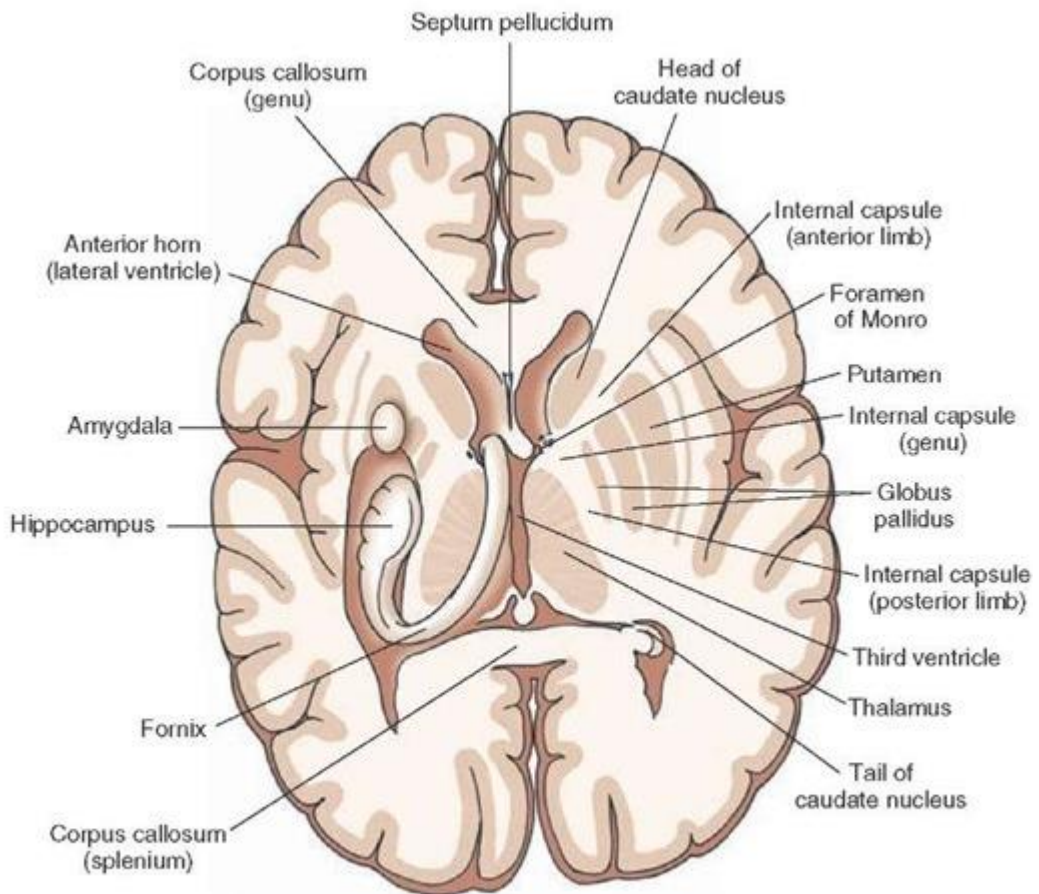
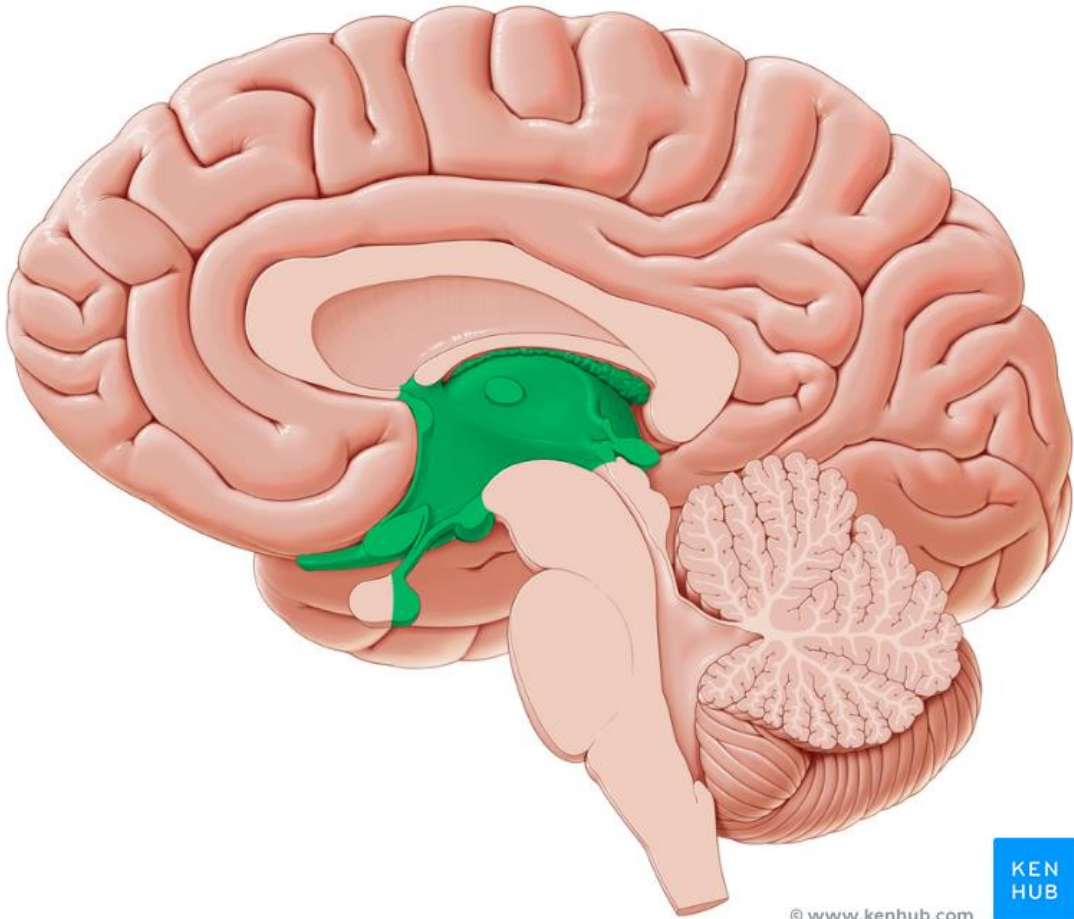


Diencephalon

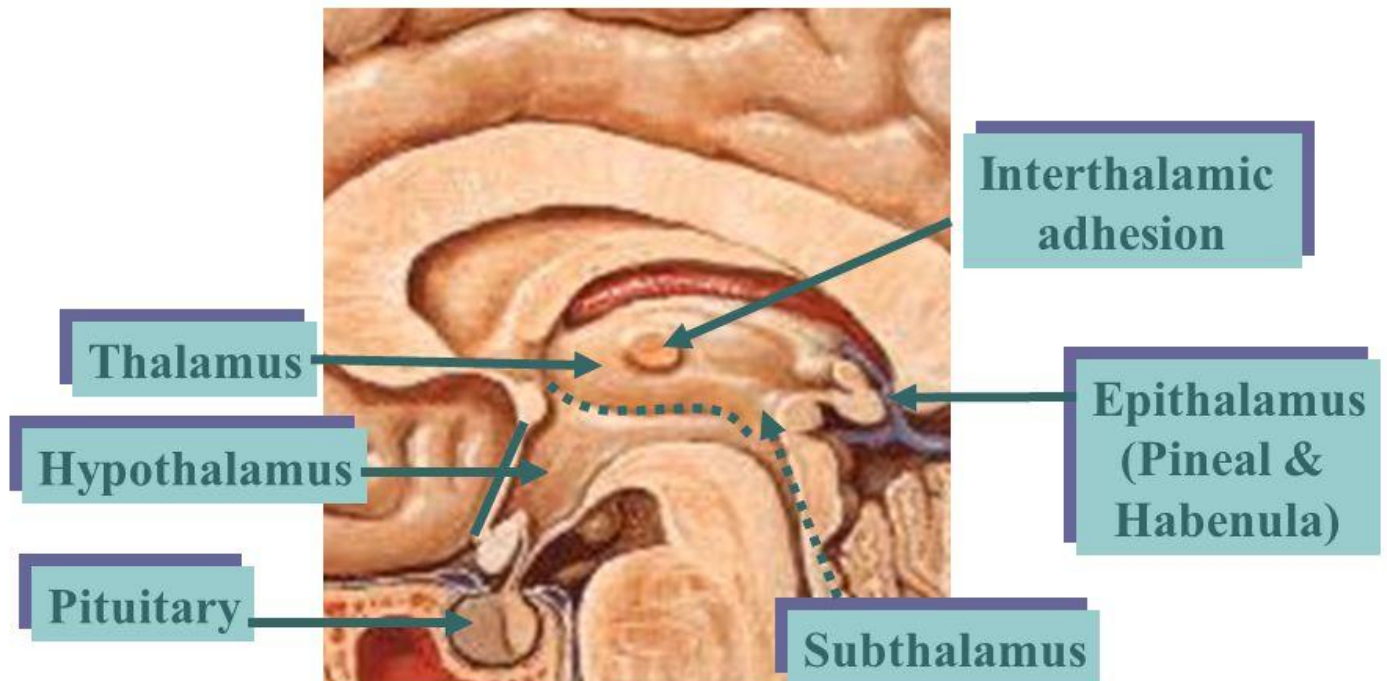
* **Site:** It is the part of the brain which:

- Lies **between** the lower parts of the 2 cerebral hemispheres.
- Lies **above** the midbrain.
- **Surrounds** the 3rd ventricle.



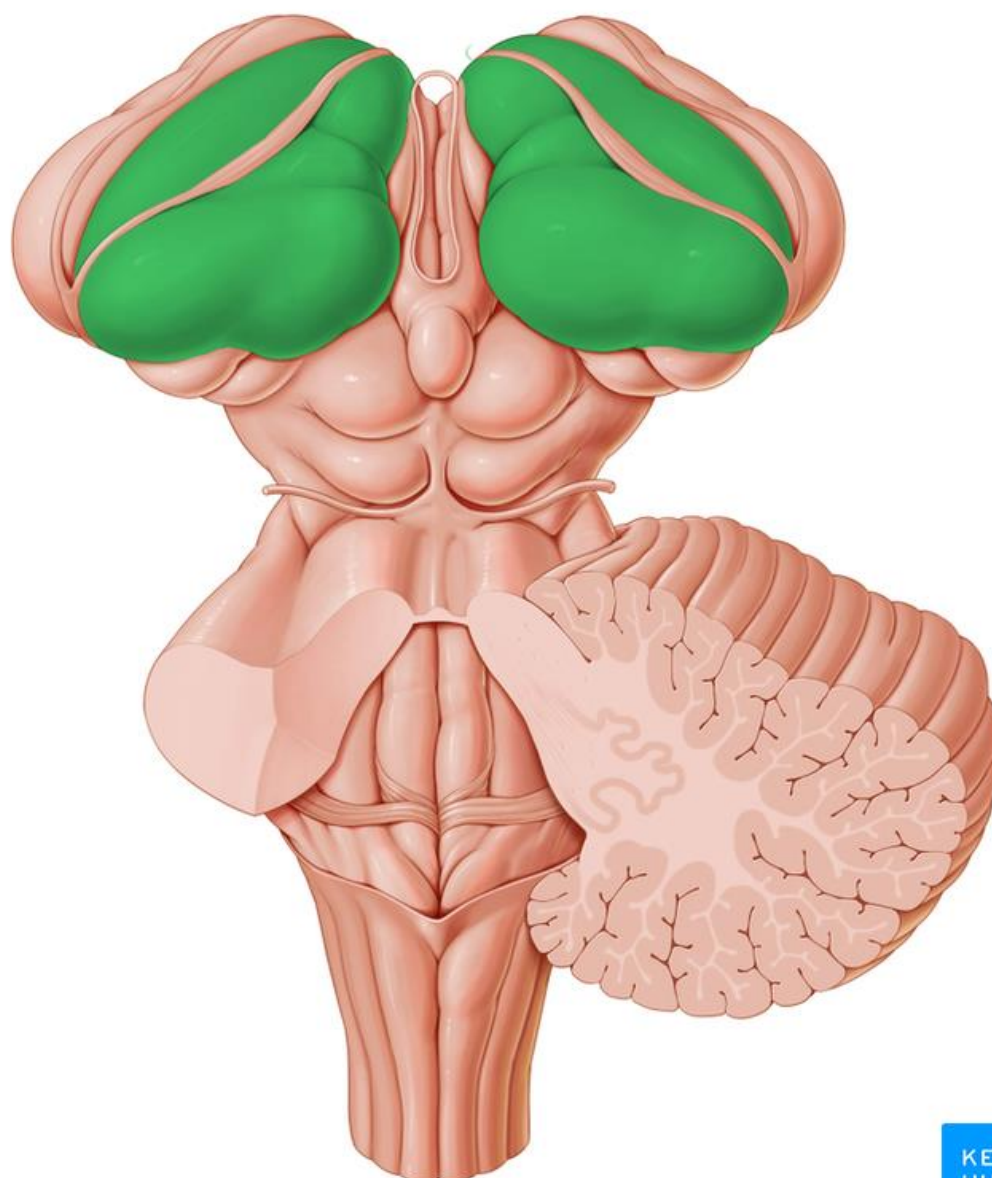
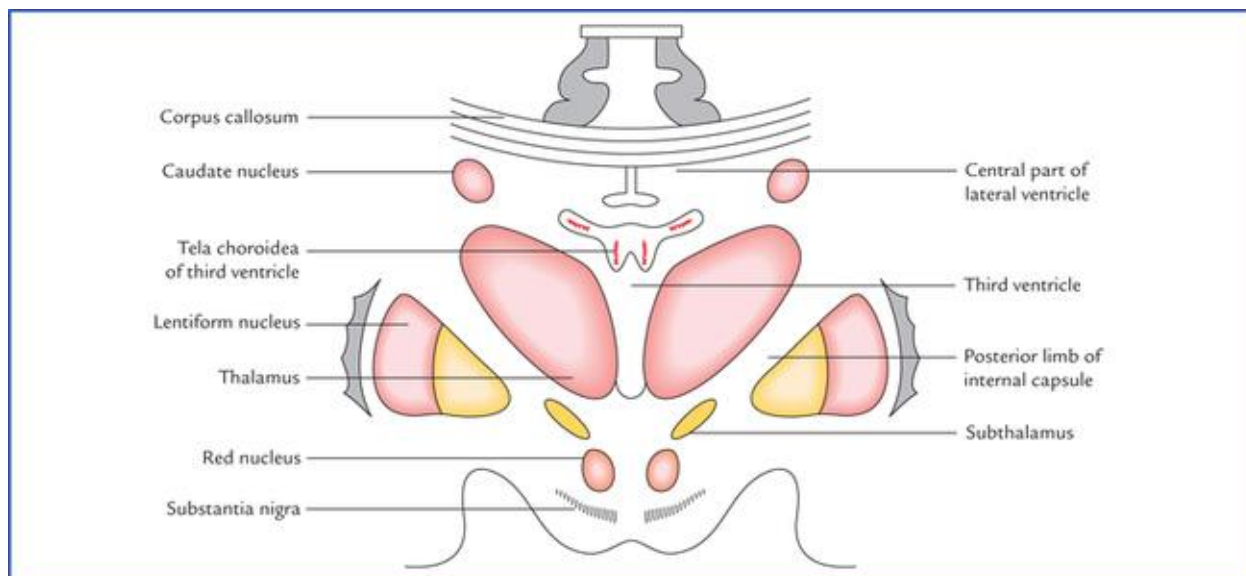


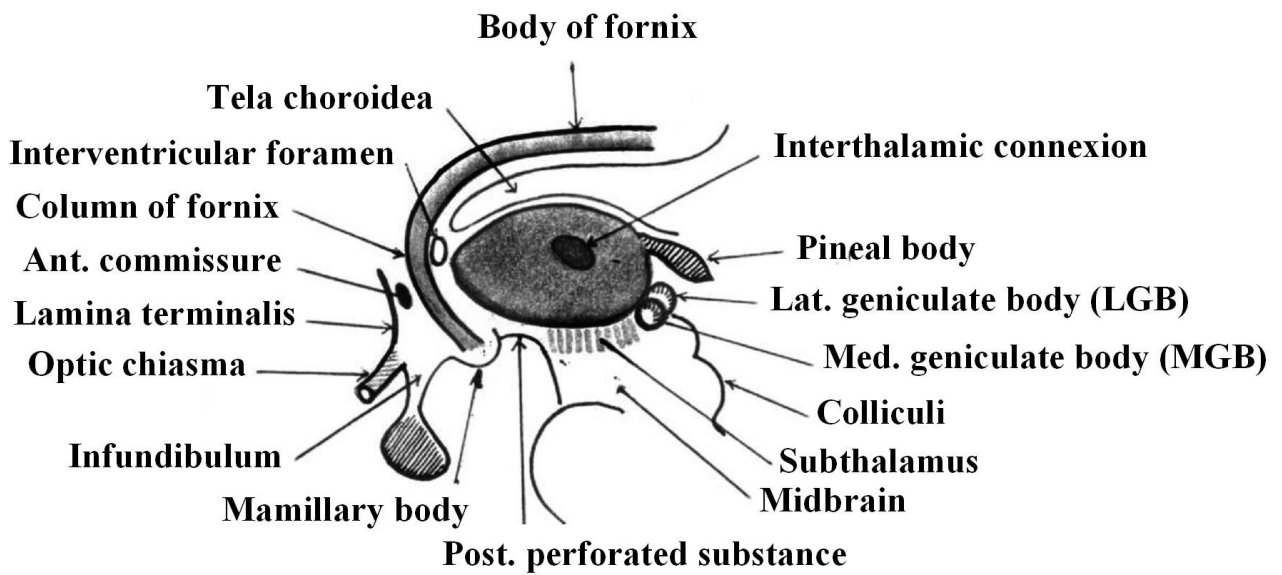
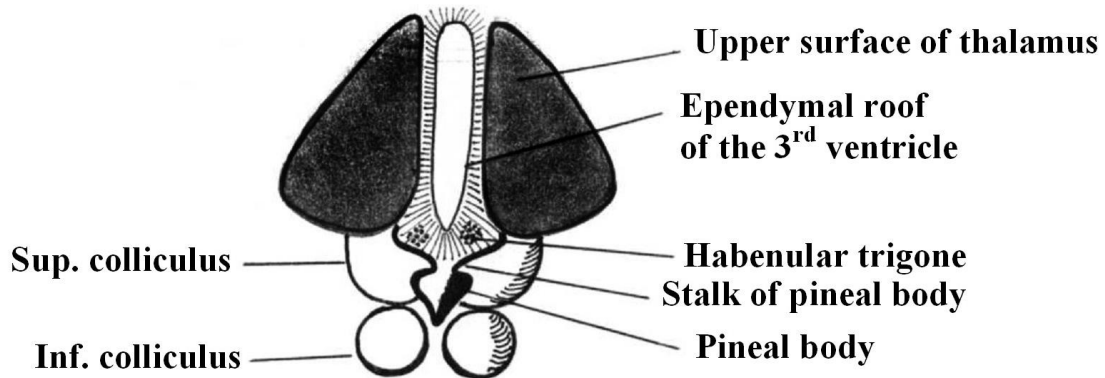
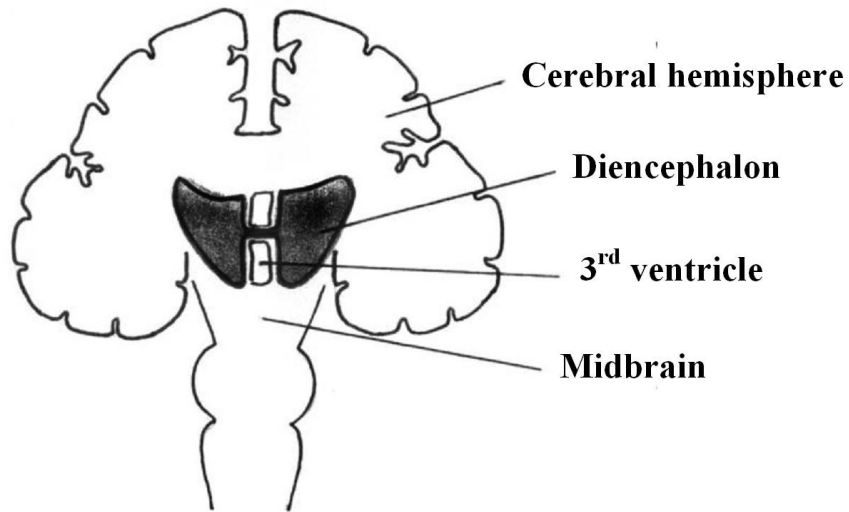
The Diencephalon



* **Subdivisions:** 5 parts:

- a- **Thalamus:** Is the **largest** part. It is the **secretory** of the cerebral cortex; **all ascending sensory impulses (except smell)** have to **stop** and **synapse** first in the thalamus **before** reaching the cerebral cortex.
- b- **Metathalamus:** Is formed of the **lateral and medial geniculate bodies** which are **attached to** the lower surface of the posterior end of the thalamus.
- c- **Subthalamus:** Is the part which lies directly **above the midbrain**.
- d- **Hypothalamus:** Lies in **front of the subthalamus**; it contains certain **autonomic nuclei**.
- e- **Epithalamus:** Is formed of the **2 habenular trigones** , the habenular **commissure** and the **pineal gland** . It is a relay station on the **descending pathways from smell centres** in the cerebral hemisphere to the tegmentum of the **midbrain**.



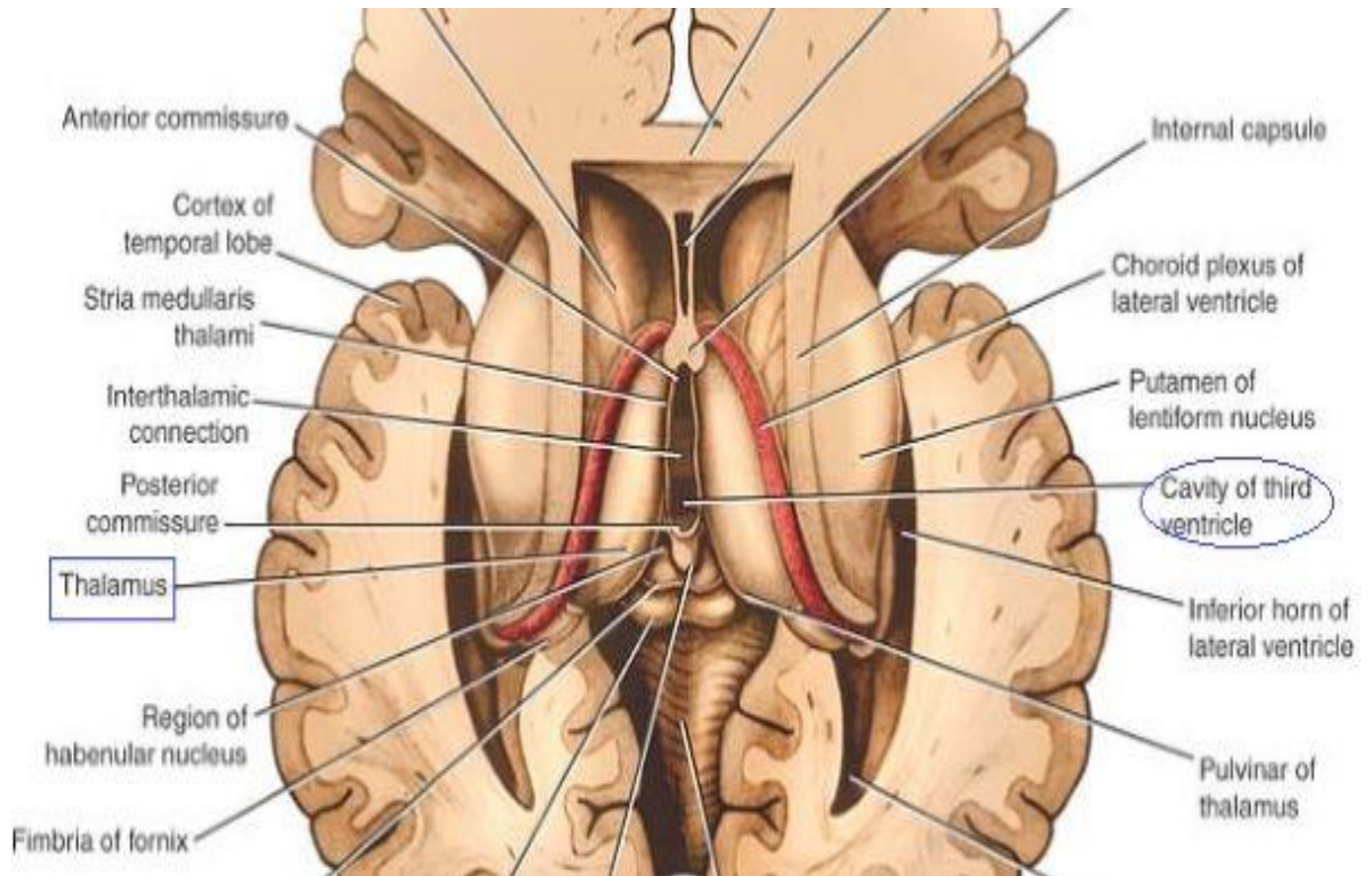
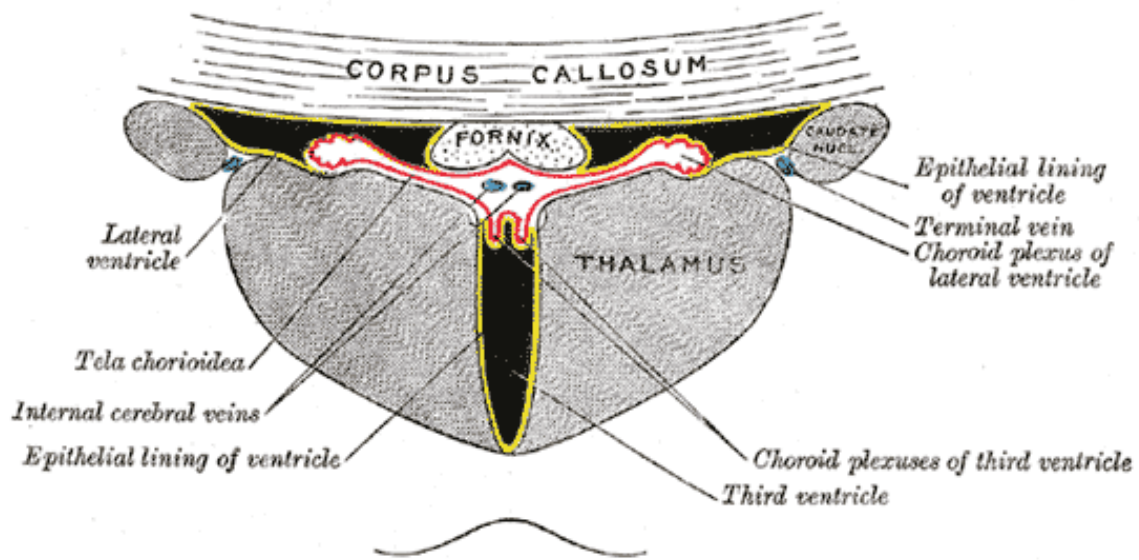


Sagittal Section Showing:
 - Parts of diencephalon
 - Relations of thalamus

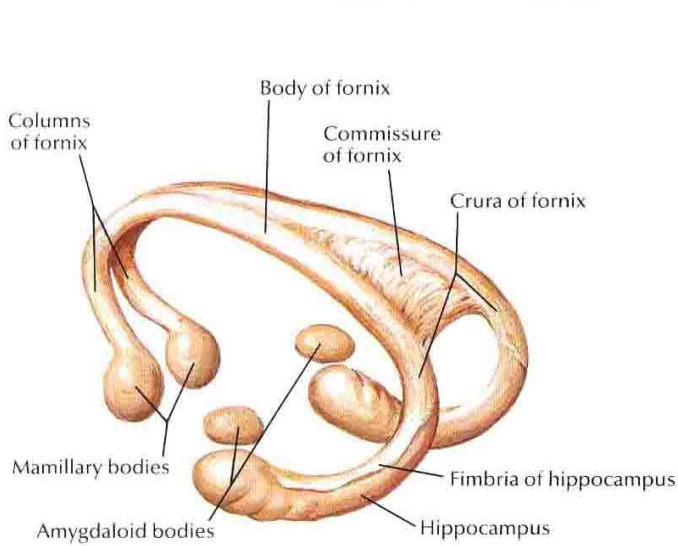
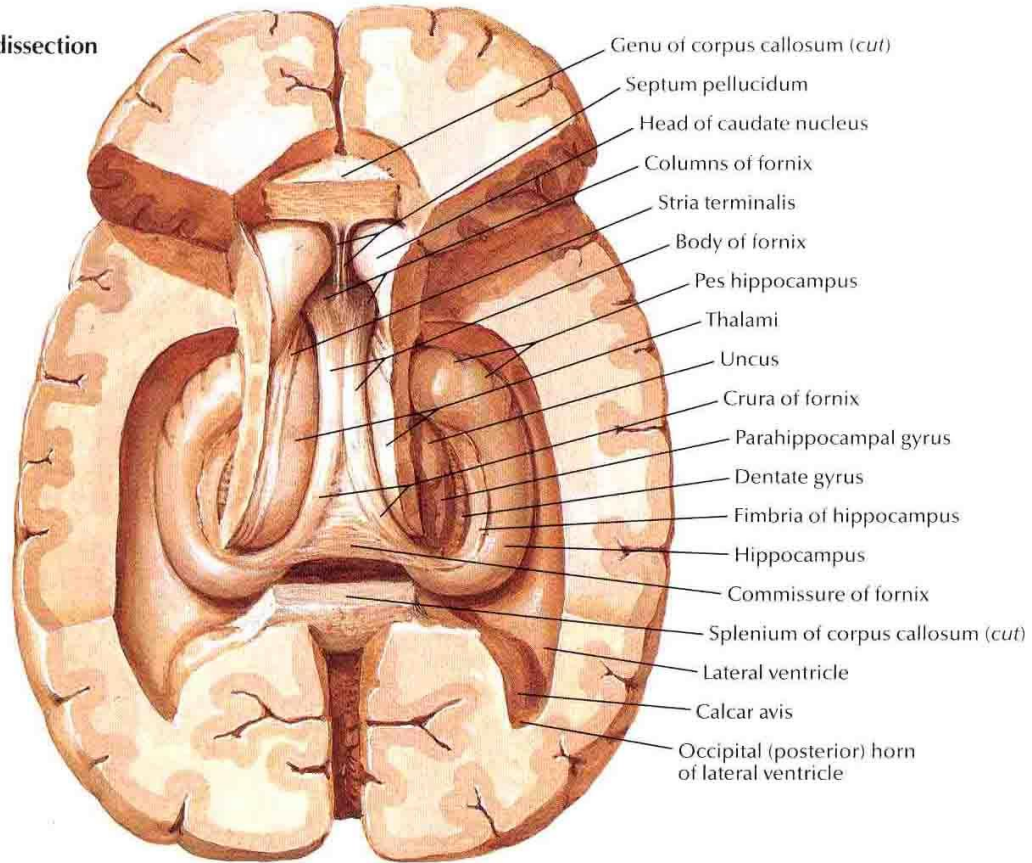
The Thalamus

- * It is a **large oval mass** of **gray matter** (4 cm long).
- * **Site:** It is situated on both sides of **3rd** ventricle, immediately above the **subthalamus** which separates it from **the tegmentum of the midbrain** .
- * **Shape and relations:** It is **oval** in shape having:
 - 1-Anterior end:** is **narrow** and **rounded** and forms the **posterior** boundary of the **interventricular foramen**.
 - It contains the **anterior nucleus** of the thalamus.
 - 2-Posterior end:** is **expanded** & prominent called the **pulvinar** which **overhangs** the medial and lateral **geniculate bodies**.
 - 3-Upper surface:** Which can be divided into:
 - **Medial extra-ventricular** part : covered by the edge **tela choroidea** of the 3rd ventricle and the body of the **fornix**.
 - **Lateral intraventricular** part : lies in the **floor of the body of lateral ventricle**, covered by **ependyma** and partly hidden by the **choroid plexus** of the lateral ventricle.
 - 4- Lower surface:** is divided into **3** parts:
 - The **anterior** part: is related to the **hypothalamus**
 - The **middle** part is related the **subthalamus** which lies **over** the midbrain.
 - The **posterior** part is formed by the **metathalamus** (medial and lateral geniculate bodies).
 - 5--Medial surface:** forms the **lateral wall of the 3rd ventricle** , thus covered by **ependyma**, and is **connected** to its **fellow** by a mass of **gray** matter called the **interthalamic adhesion** .
 - 6--Lateral surface:** Which is related:
 - **Above:** to the **body of caudate** nucleus separated from it by the **stria terminalis and the thalamo-striate vein**.
 - **Below:** to the **posterior limb of the internal capsule** separating the thalamus from the **lentiform nucleus**.

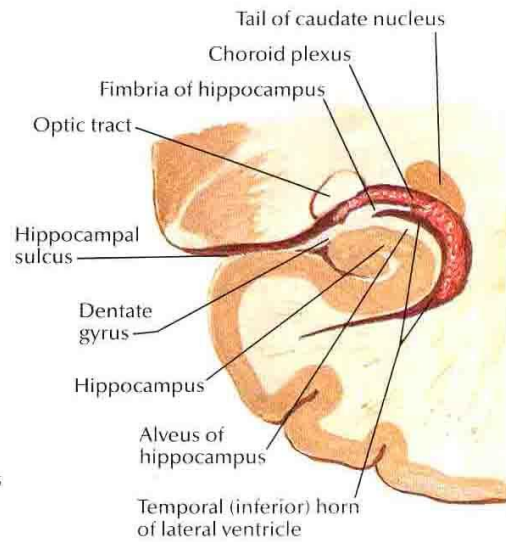
6- The **posterior** part is formed by the **metathalamus** (medial and lateral geniculate bodies).



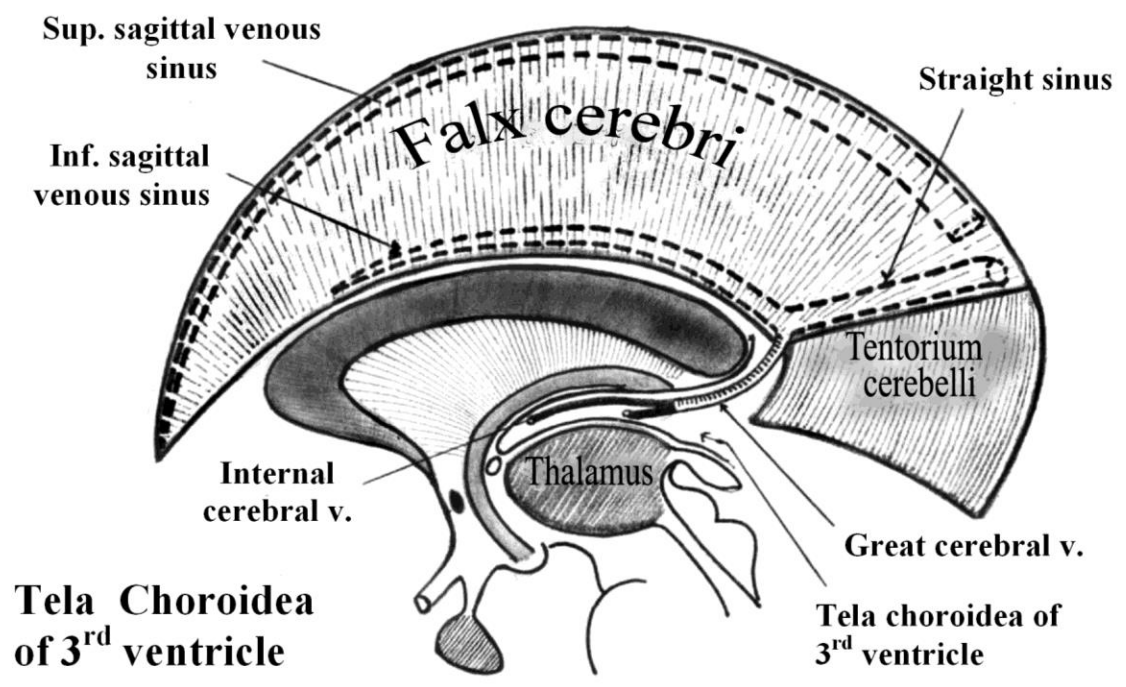
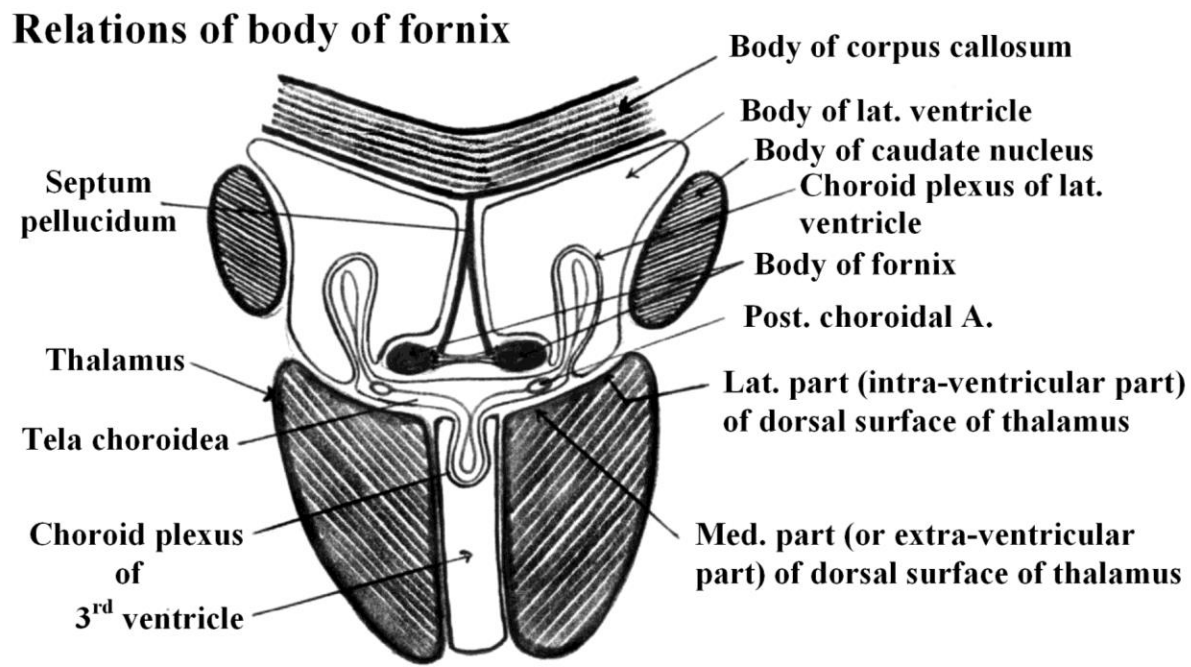
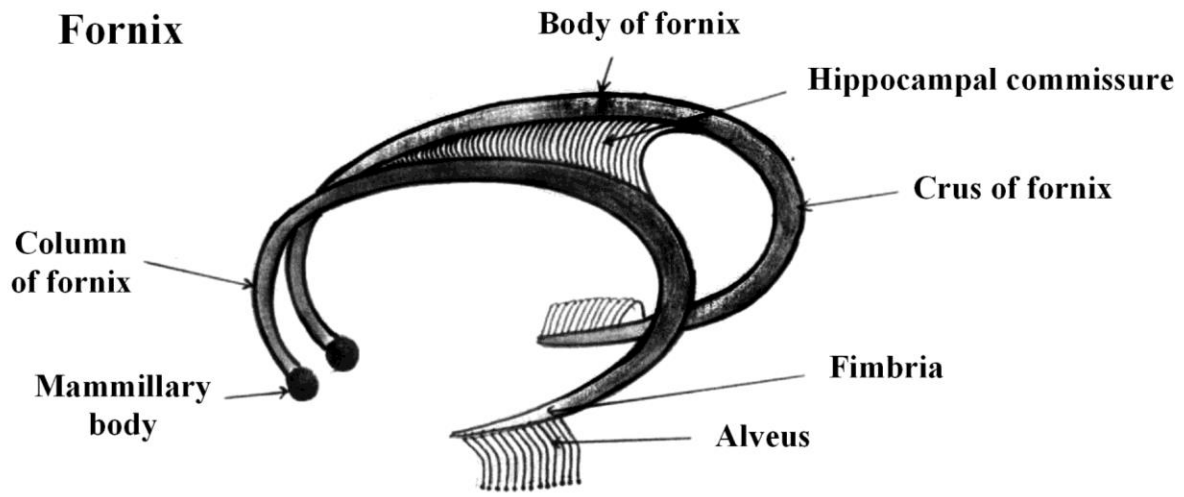
Superior dissection

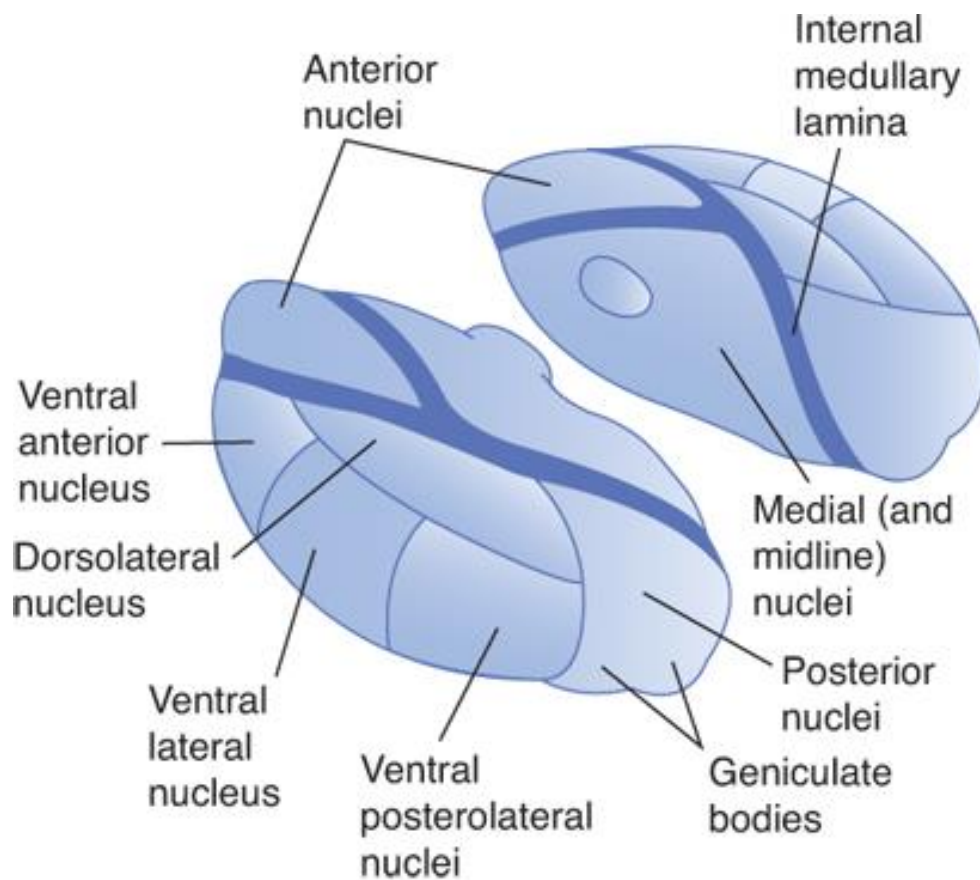
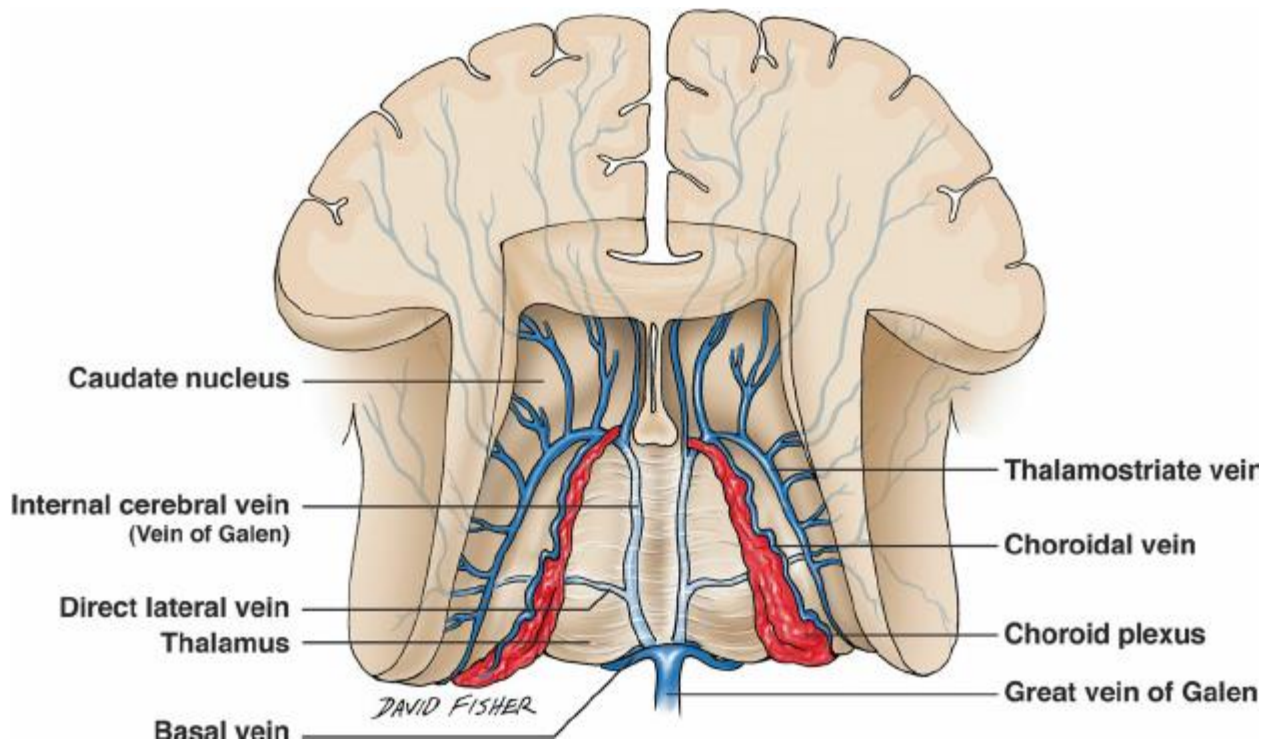


Fornix: schema



Coronal section: posterior view





Source: Stephen G. Waxman
 Clinical Neuroanatomy, Twenty-Eighth Edition
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* ***Nuclei of the thalamus:***

- The thalamus is **divided** by a **Y-shaped vertical sheet** of white matter called the **internal medullary lamina** into 3 parts:
 - a- The **anterior nucleus**:
 - Occupies the narrow **anterior end** of the thalamus.
 - It receives its **afferent** fibres from the **mammillary** bodies via the **mammillo-thalamic tract**.
 - It sends its **efferents** through **anterior thalamic radiation** to the **cingulate** gyrus.
 - b- The **medial nucleus**:
 - Receives its **afferent** fibres from the nuclei of the **hypothalamus**.
 - It sends its **efferents** to the **frontal pole** of the cerebral cortex.
 - It is concerned **mainly** with the **visceral sensations** & provide a **center** for **integration** for visceral and somatic activity.
 - c- The **lateral nucleus**:
 - It is **subdivided** into **dorsal** and **ventral** part which are **in turn subdivided into** several **smaller nuclei**; the **most important** of the ventral nuclei is the posterior ventral nucleus of thalamus (**PVNT**).
 - The PVNT can be divided into:
 - 1- Lateral part (**PLVNT**) which **receives**:
 - Conscious proprioceptive, fine touch sensations from the opposite side of body below the head via the **medial lemniscus**.
 - Pain, temperature and crude touch sensations from the opposite side of the body below the head via the **spinal lemniscus**.
 - 2- Medial part (**PMVNT**) which receives:
 - Pain, touch, temperature , proprioceptive and taste sensations from the opposite side of the head via the **trigeminal lemniscus**.
 - The PVNT sends its **efferent** fibres , through **superior thalamic radiation** , to the main sensory area (**3, 1 , 2**) in the postcentral gyrus of the parietal lobe.
 - d- The posterior end expanded to form the **pulvinar** which contains the posterior nucleus:

- It sends **efferent** fibres to the **inferior parietal lobule**. It seems to have an **associative function**.

* **Function of thalamus :**

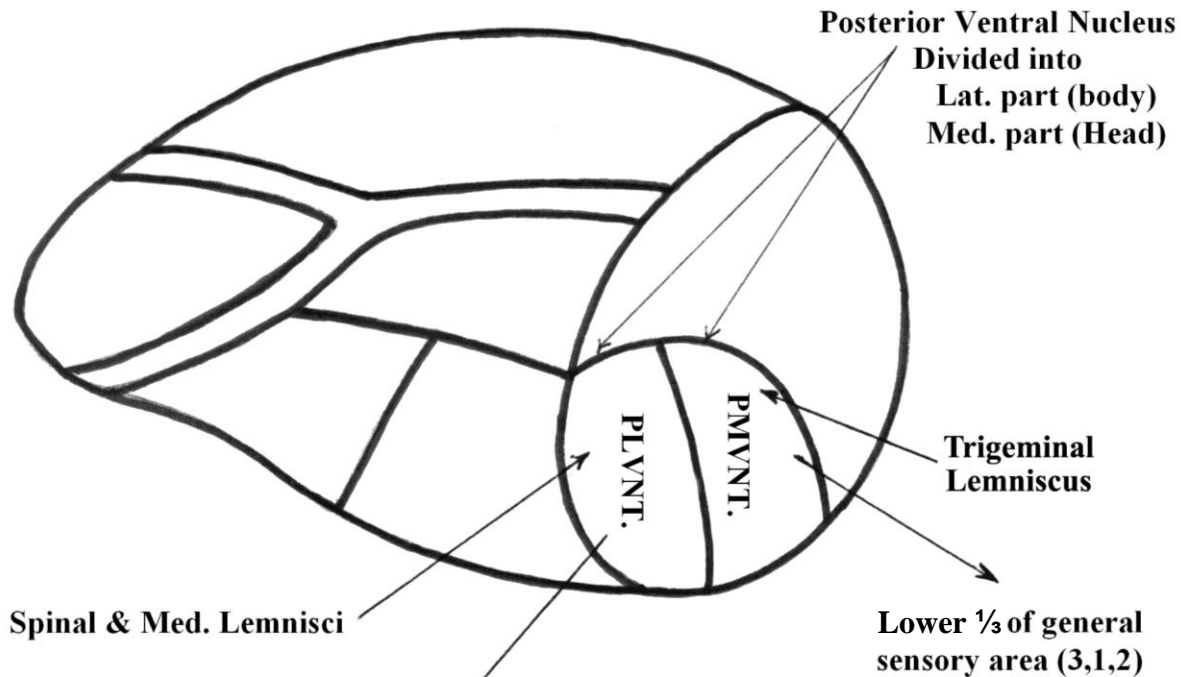
1- The thalamus receives a large number of **information** from spinal cord, brain stem , cerebellum , reticular formation , hypothalamus and corpus striatum .

-2- The thalamus sends these information through **efferent** fibres via the **internal capsule** to all parts of the cerebral cortex (**thalamo-cortical fibres or thalamic radiation**) which **influence the cortical activity**.

3- All the thalamic nuclei **receive projection** fibres from many parts of the cortex (**cortico-thalamic fibres**) which enable the **cortex to influence the thalamic activity** .

4- In addition it **sends fibres to subcortical centers** as the **corpus striatum** and the **subthalamic** nuclei.

-



Upper 2/3 of general sensory area (3,1,2) in the postcentral gyrus

Function: (3rd order Neurons)

Receives all general sensations from the opposite side of the body

Lesion: Contralat. loss of general sensations from body below the head

Function: 3rd order neurons

Receives all general sensations & Taste from the opposite side of the head

Lesion: Countralat. loss of general sensations from face & head

* * *

Intralaminar & Reticular Nuclei:

- **Input:** from reticular formation & other thalamic nuclei.
- **Output:** to all areas of cerebral cortex.
- **Function:** part of reticular activating system (RAS) for cortical arousal mechanism.

Metathalamus (Geniculate Bodies)

- They are placed on the **lower surface** of the posterior end of the thalamus (**pulvinar**).
- The metathalamus consists of the **geniculate bodies** .
- They are **centres of hearing and vision**:

1- Medial geniculate body (MGB):

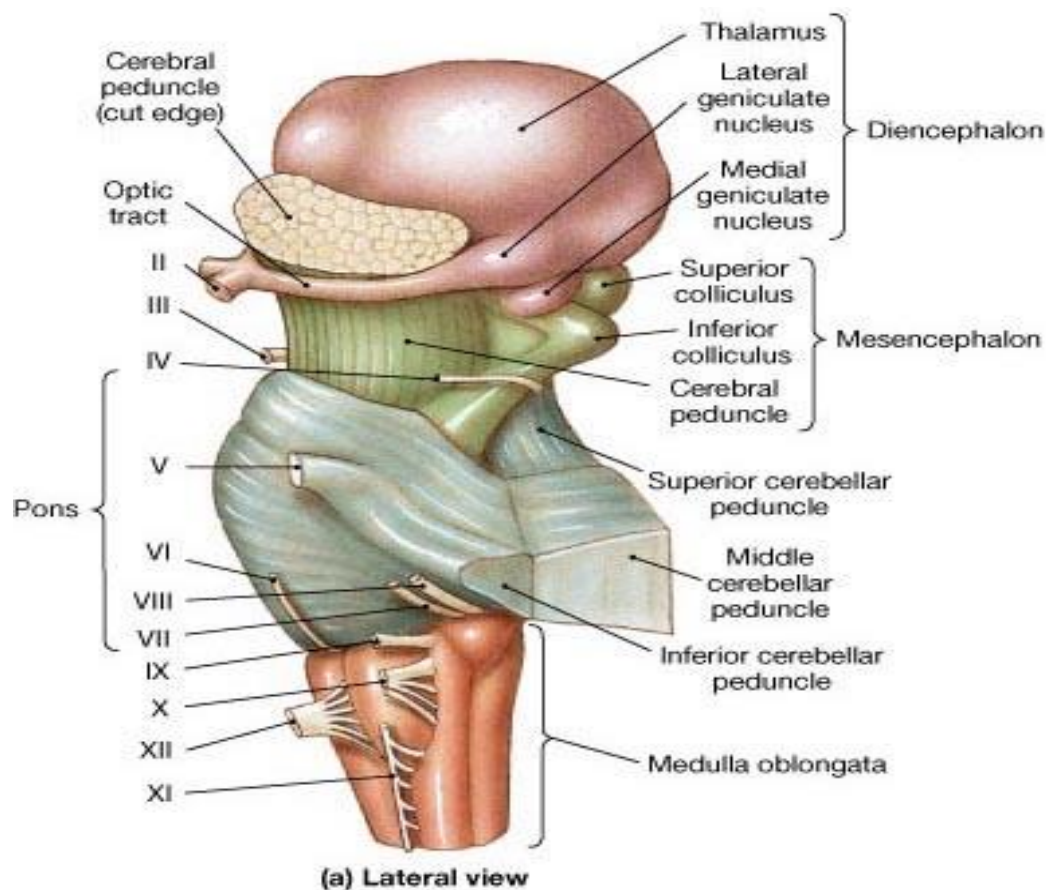
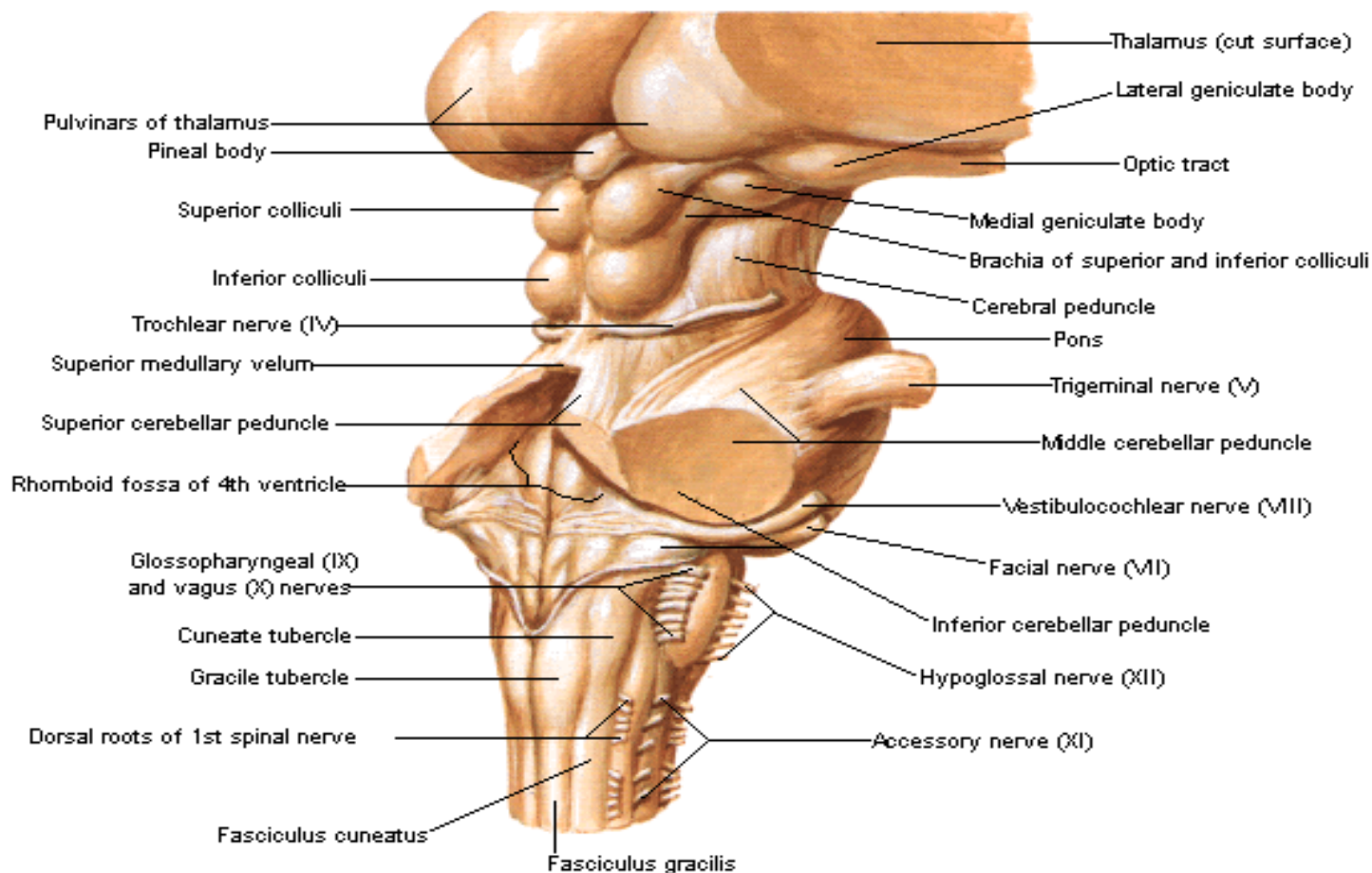
- Receive **afferent auditory** fibres either **directly** from the **lateral lemniscus** or **indirectly** from the **inferior colliculus via the brachium** of the inferior colliculus.
- Its **efferent** fibres, pass via the **sub-lentiform** part of the internal capsule; **auditory radiation**, to the **superior temporal gyrus** (area **41 and 42**).
- It **functions** as a relay station on the auditory pathway. (the **4th order neurons** in the pathway of hearing).

2- Lateral geniculate body (LGB):

- Receives **afferent** fibres from the **optic tract**.
- Its **efferent** fibres, pass via the **retro-lentiform** part of the internal capsule , **visual radiation** , to the **occipital cortex (area 17)**.
- It constitutes **3rd order neurons** in the pathway of **vision**. It represents the **only synaptic interruption** on the visual pathway from the retina to the visual cortex.

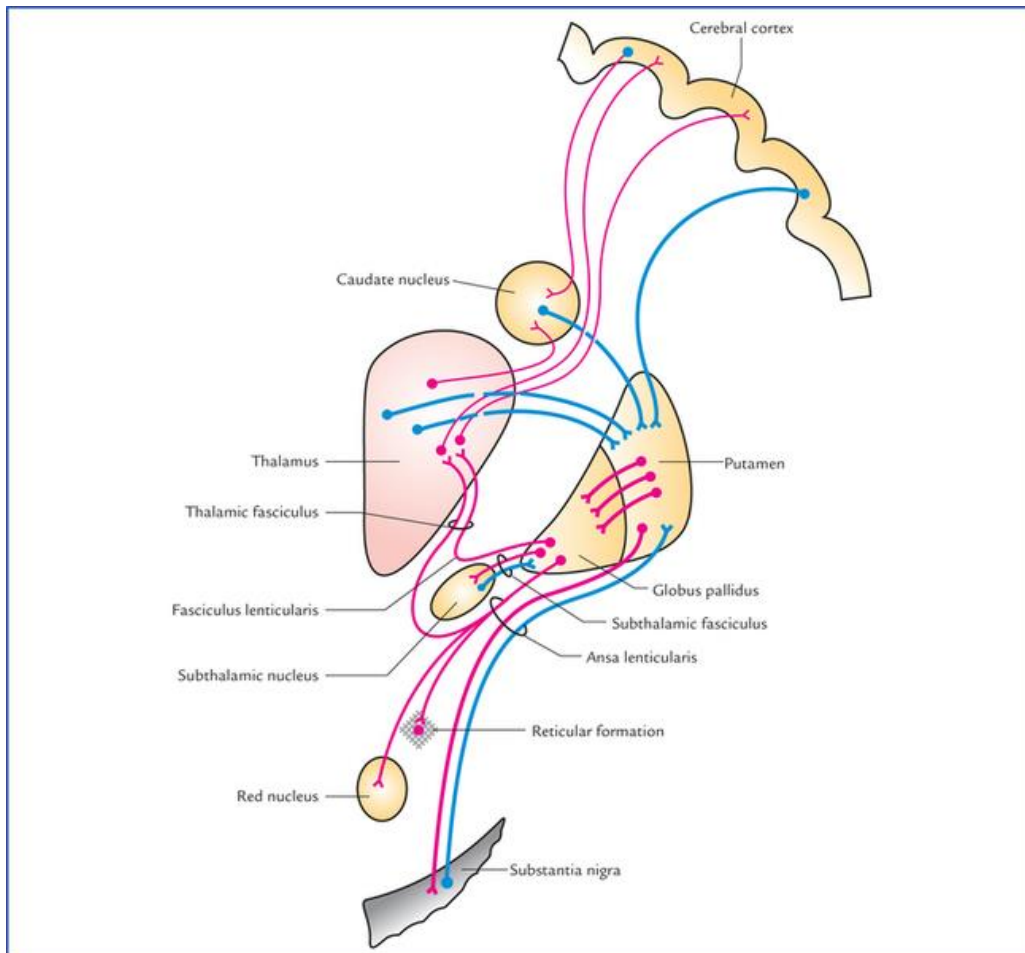
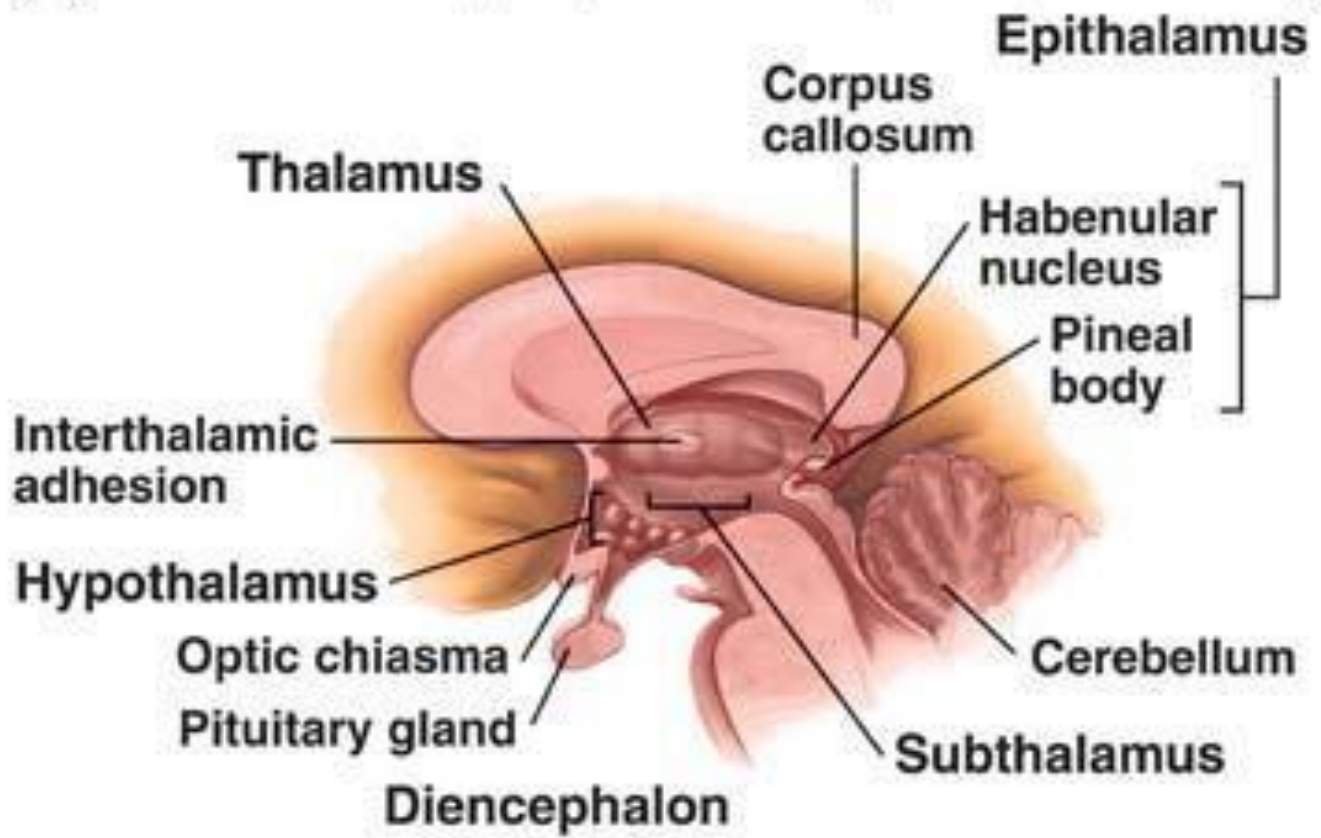
Brainstem

Posterolateral View



The Subthalamic Region

- It is the part of the diencephalon which lies immediately **below the thalamus** and connects it to the **tegmental region of the midbrain**.
- It can be divided into **2 parts**; (posterior and anterior):
 - 1- Its **posterior part** contains **5 bundles** which **ascend** from below to reach the **thalamus**. These bundles are the **medial lemniscus, spinal lemniscus, trigeminal lemniscus, reticulo-thalamic tract** and **cerebello-thalamic fibers** (ascending fibres of the superior cerebellar peduncle).
 - 2- Its **anterior part** contains:
 - a- **Three nuclei**:
 - Upper end of the **red nucleus**.
 - Upper end of **substantia nigra**.
 - The **subthalamic nucleus** ∴. It is a part of the **extra-pyramidal** system.
 - b- **Two bundles**:
 - The **fasciculus lenticularis**.
 - The **ansa lenticularis**.
- These 2 bundles **form pathways** which descend from the **lentiform nucleus** to reach the **tegmentum** of the midbrain.



The Hypothalamus

* The **hypothalamus** comprises:

- a. **Horizontal part** the structures which form the **floor of the 3rd ventricle** (the contents of the **inter-peduncular fossa**); they are: the infundibulum, the tuber cinereum, the mammillary bodies and the posterior perforated substance.
- b. **Vertical part** the structures which lie in the **lateral wall of the third ventricle** below and in front of the **hypothalamic sulcus**.

