Diencephalon

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Brain stem

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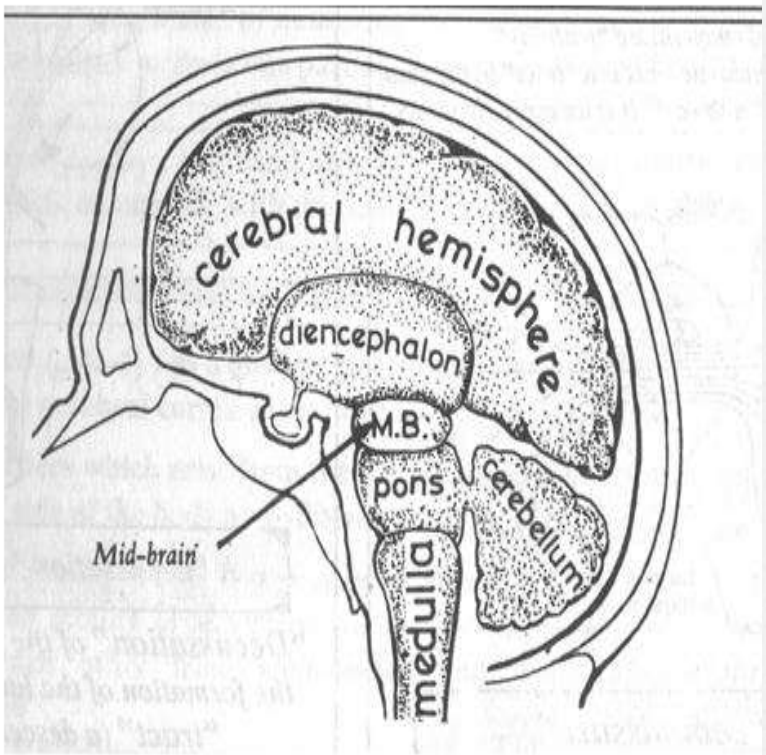
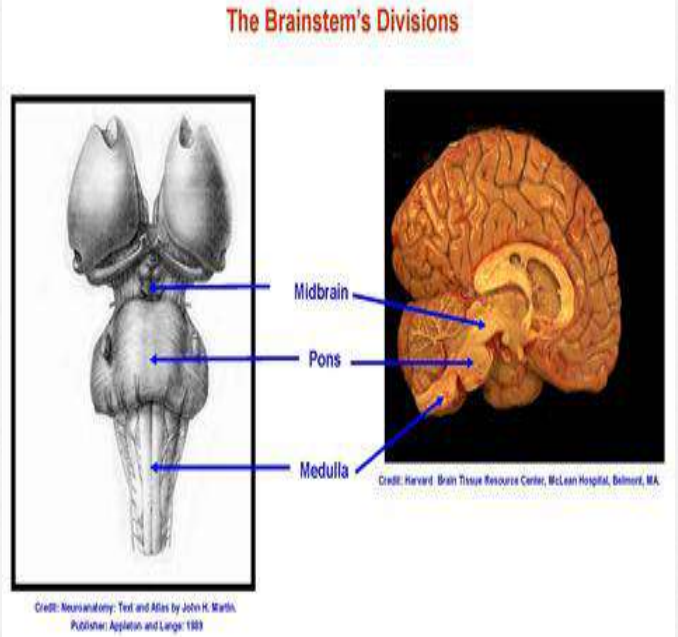
Def:

- part of brain which remains after cerebral hemisphere and cerebellum are removed
- Consist of :
- Midbrain
- Pons
- Medulla oblongata
- Diencephalon (included)
- Brain stem: T
- -pons and medulla = verticle piece
- Diencephalon = transverse piece

Brain stem


cerebral hemisphere
diencephalon
M.B.
pons
Cerebellum
Mid-brain
Medulla


The Brainstem's Divisions
Midbrain
Pons
Medulla
Credit: Harvard Brain Tissue Resource Center, McLean Hospital, Belmont, MA
Credit: Neuroanatomy: Text and Atlas by John H. Martin.
Publisher: Appleton and Lange 1989

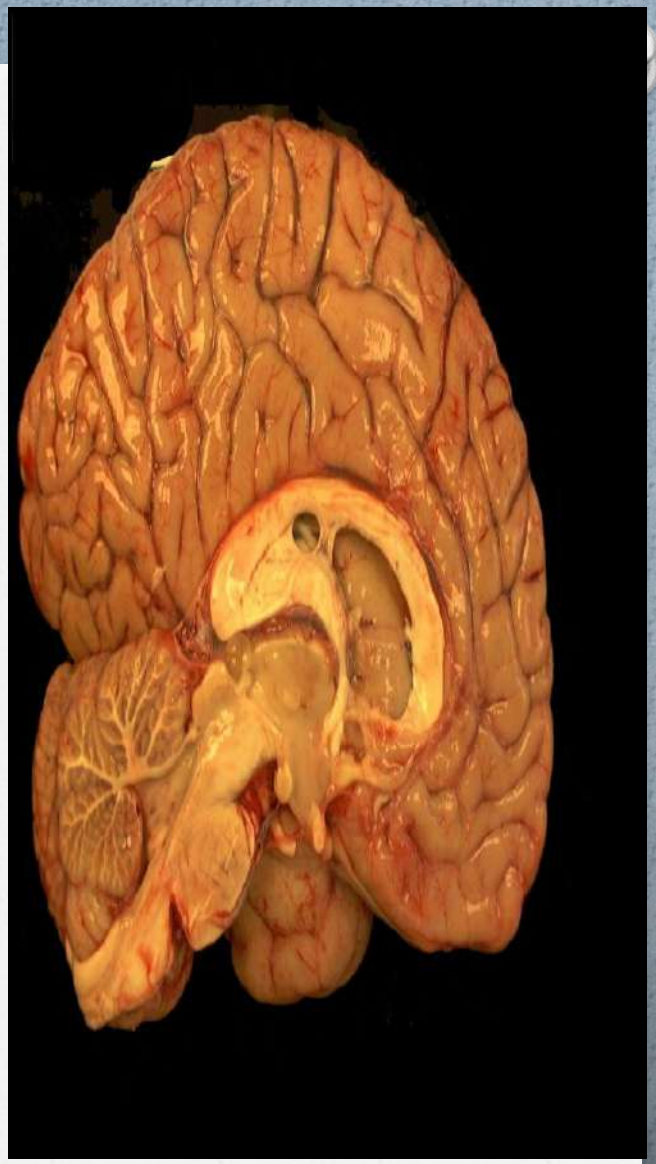
interbrain = Diencephalon

- Central core of cerebrum
- lies between Rt & Lt cerebral hemispheres
- Surrounded by 3rd ventricle
- Lies on midbrain

- Gross anatomy :
- looks like a wedge with anterior verticle border and a base faced backward
- - has 4 surfaces

* upper and lower = each have triangular outline

* 2 lateral = each has quadriangular outline



Anterior wall

- **lamina terminalis** which is a thin layer of **grey** matter

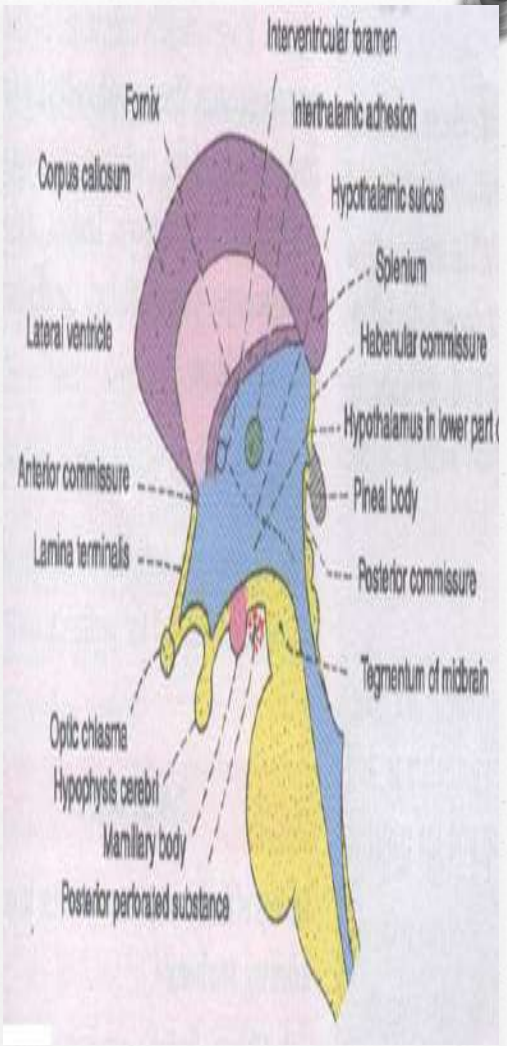
. lower end meets the optic chiasma in an angle called the **optic recess**

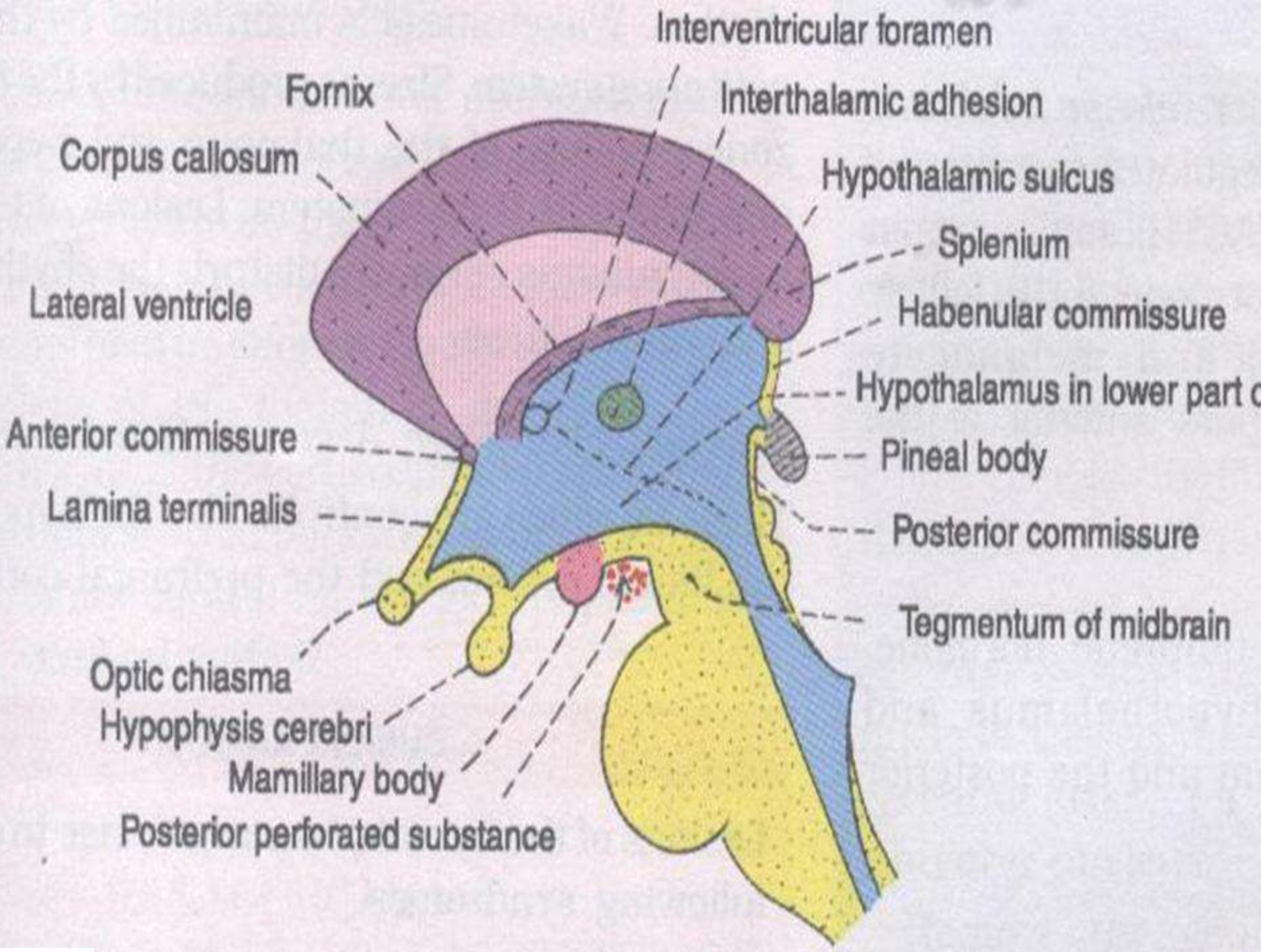
Behind its upper end is **ant commissure** connect the two temporal lobes, olfactory tracts and amygdala

Behind ant commissure are **ant columns of fornix**

-Behind each ant column is **interventricular foramen**

- connecting third and lateral ventricle




Interventricular foramen
Fornix
Interthalamic adhesion
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Anterior commissure
Pineal body
Lamina terminalis
Posterior commissure
Tegmentum of midbrain
Optic chiasma
Hypophysis cerebri
Mamillary body
Posterior perforated substance

Side wall = lateral walls

These are the lateral walls of **third ventricle**

Formed by

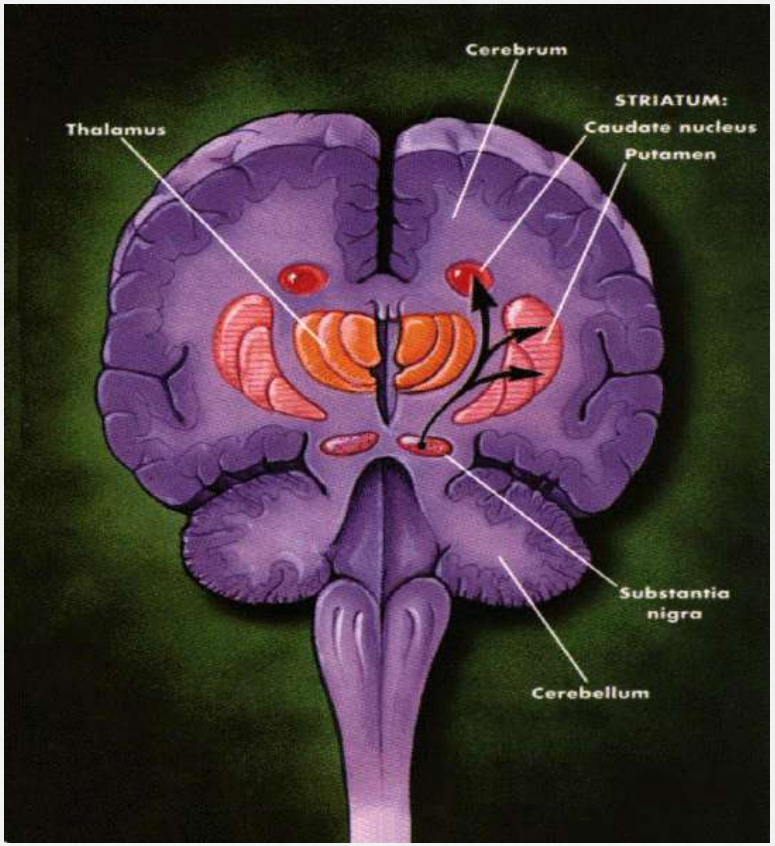
-Thalamus,

-Hypothalamic sulcus

&

-Hypothalamus

itself



Subdivisions of diencephalon :

1. **Thalamus : secretary =switch board of CC**

   large oval mass of grey matter

2. **Subthalamus :**

   directly above midbrain

   part of extrapyramidal tract

3. **Hypothalamus : –**

   Lies infront of subthalamus

   highest autonomic

   and emmotional center

4. **Metathalamus :**

   Medial geniculate body (MGB)

   Lateral geniculate body (LGB)

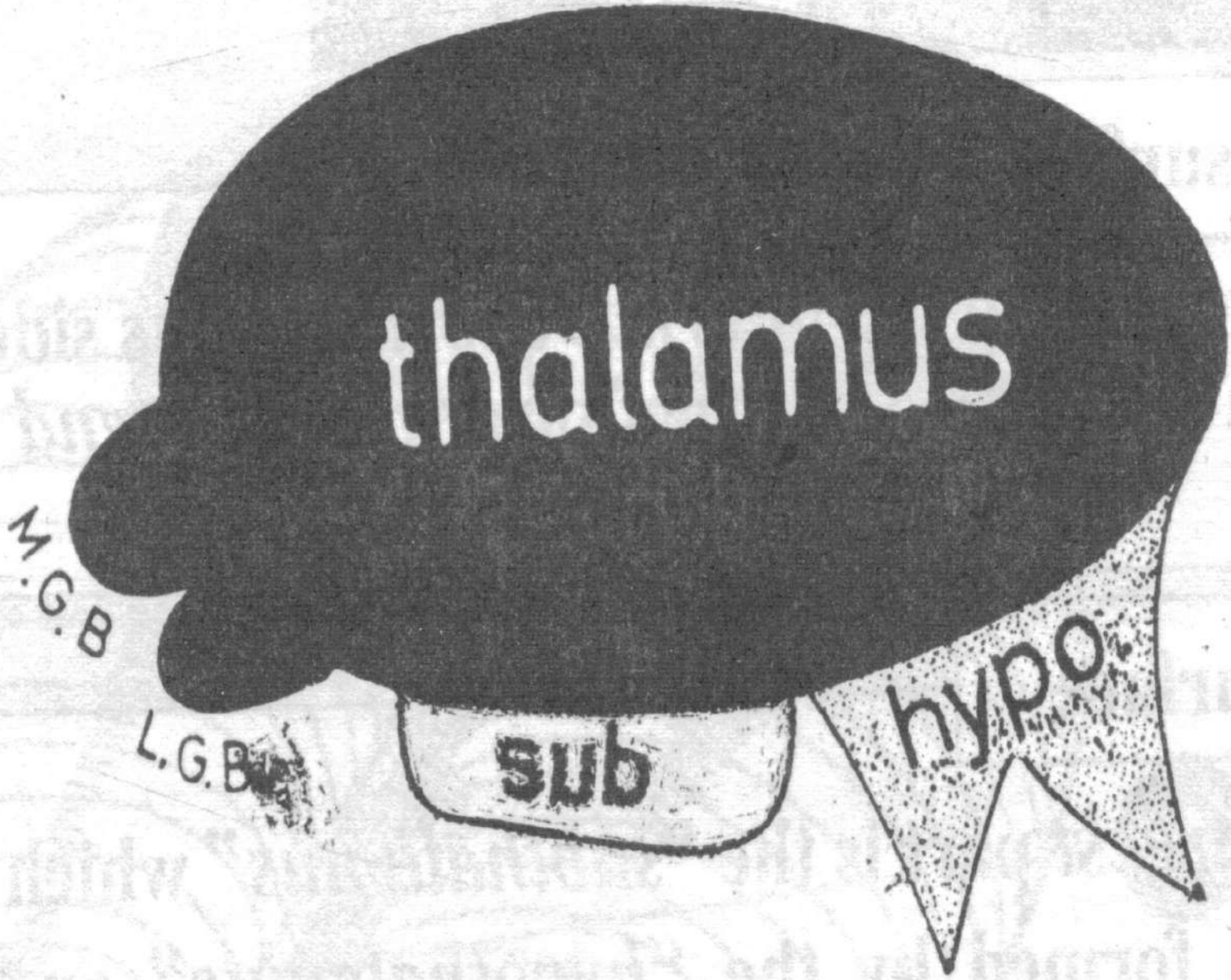
   thalamic center of hearing &

   vision

5. **Epithalamus :**

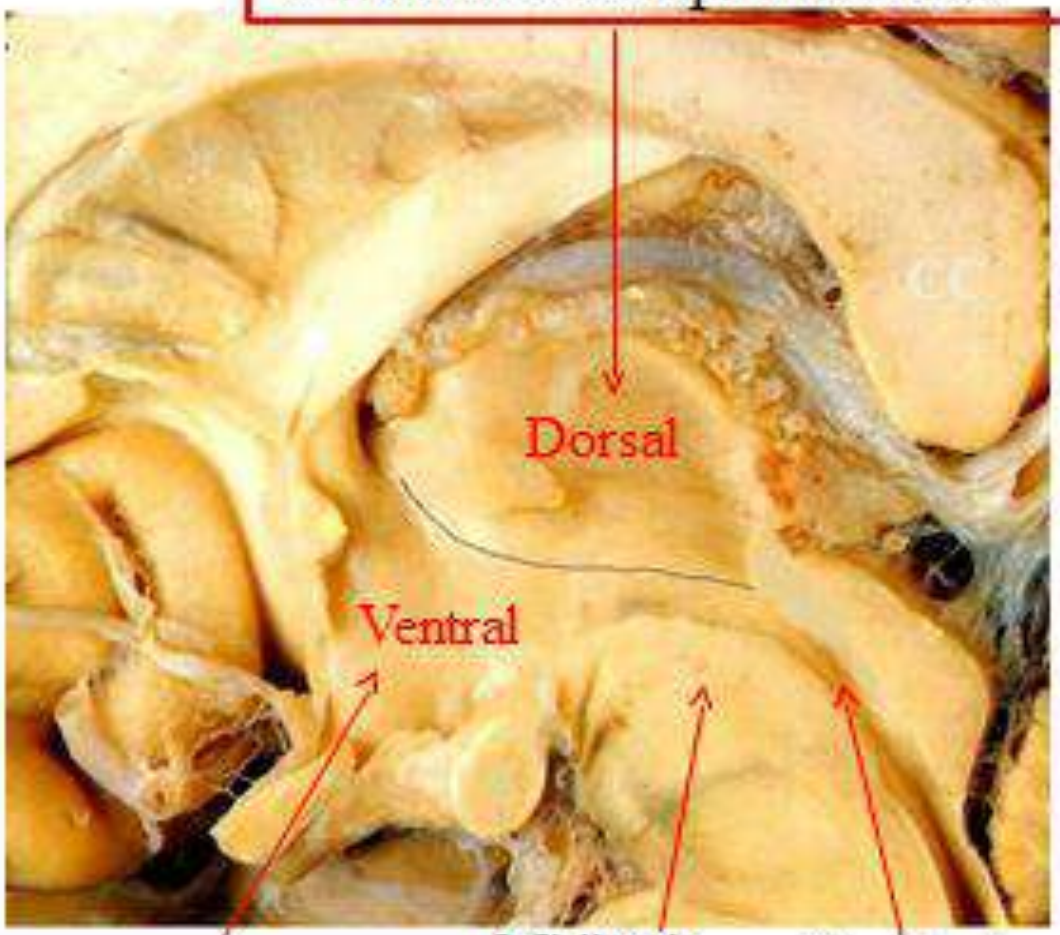
   formed of 2 habenular nuclei and

   posterior commissure

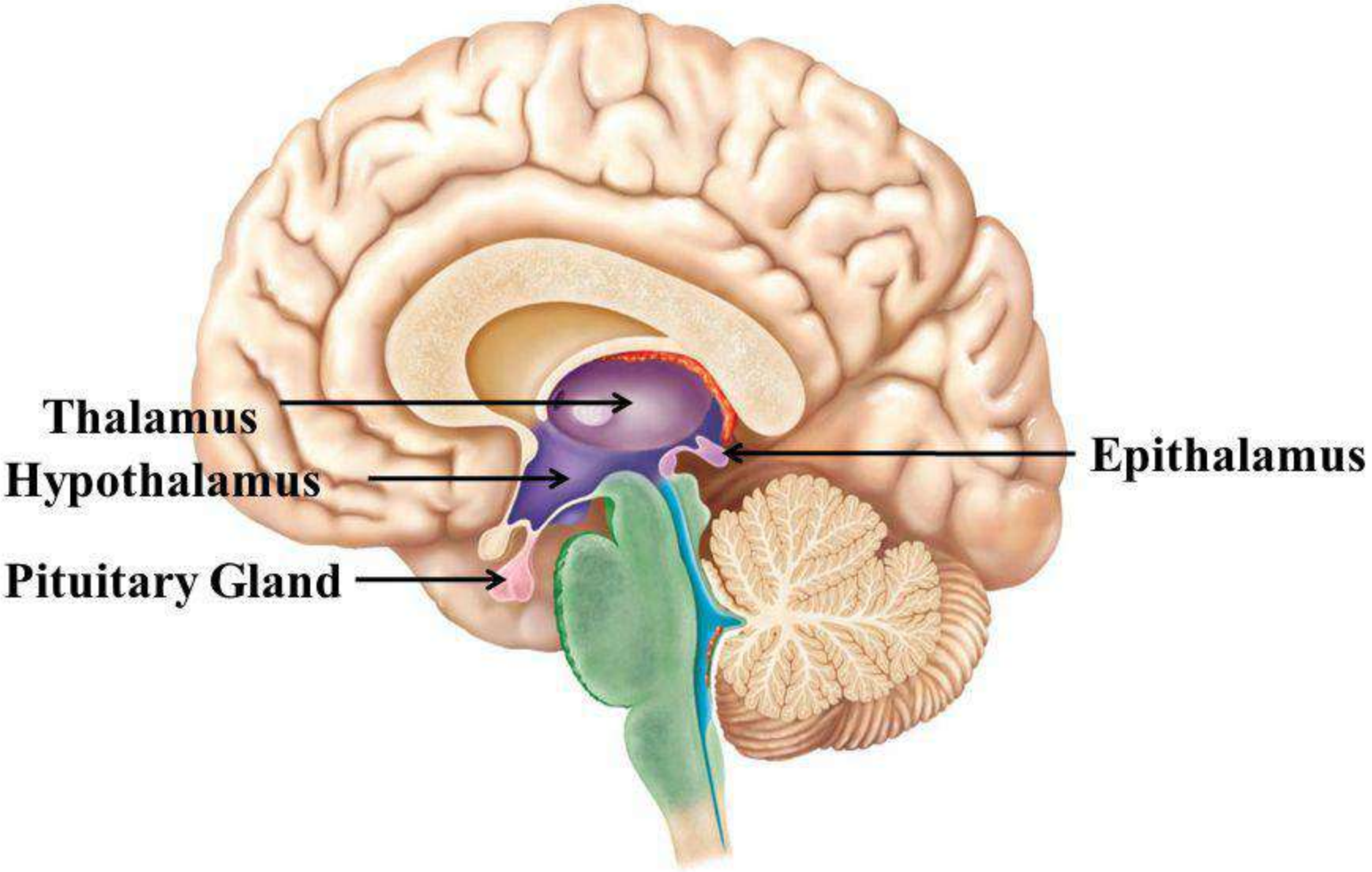

thalamus
M.G.B
L.G.B
sub
hypo

- On the medial surface, the diencephalon is subdivided, by hypothalamic sulcus (indicated by black line) into:
  - Dorsal part:
  - Ventral part:

Dorsal part
Thalamus & Epithalamus



Ventral part
Subthalamus & Hypothalamus



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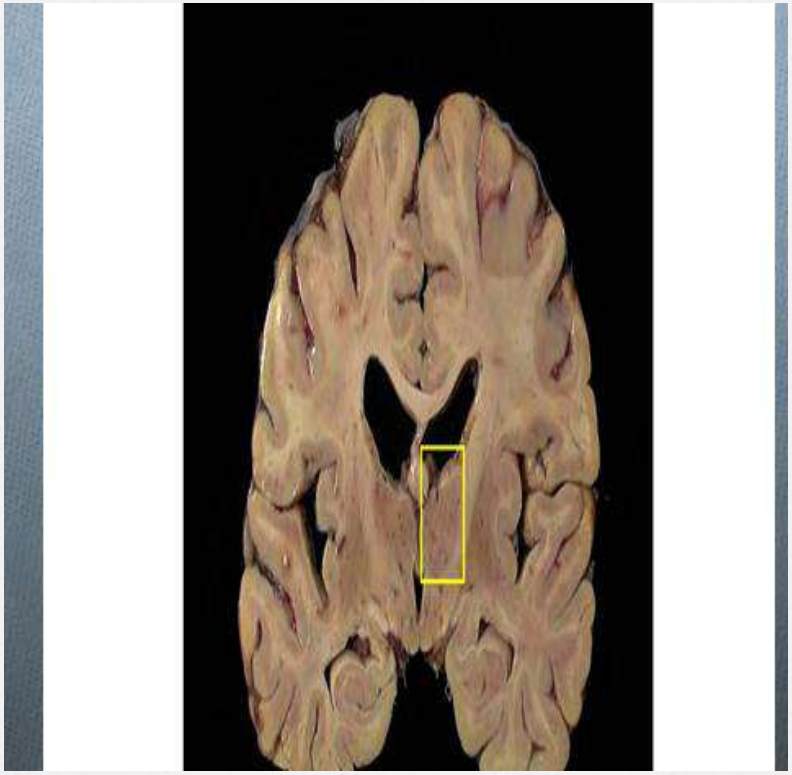
Thalamus

- large egg -shaped paired mass of **grey** matter
- form **major** part of diencephalon
-
- Form 2/3 of lateral wall of 3rd ventricle
- 2 ends

  Anterior

  Posterior =pulvnar



Thalamus

.

Relations:

Rostrally: the interventricular foramen.

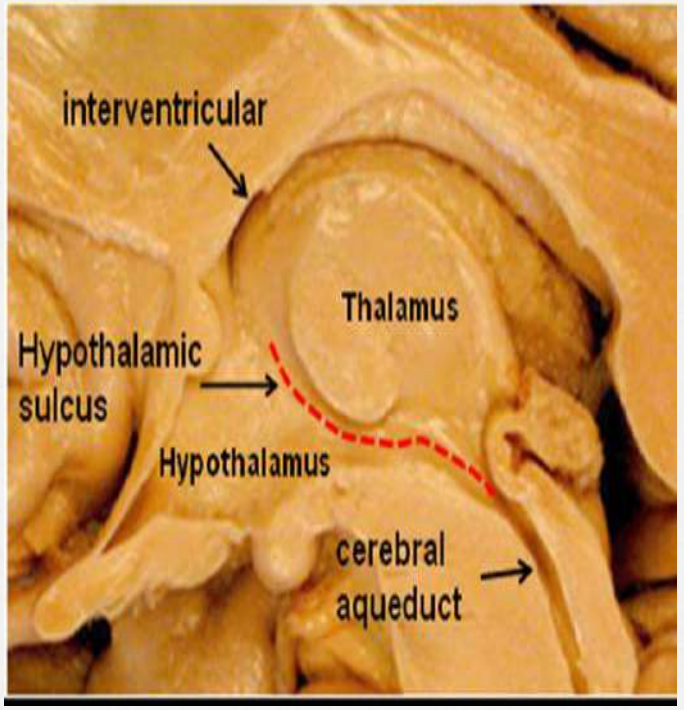
Ventrally: the hypothalamic sulcus

.

Posteriorly: the posterior commissure

Medially: the third ventricle

Laterally: the posterior limb of the internal capsule



Surfaces of thalamus

4 surfaces:

1. sup surface

convex . triangular

A band of white matter called medullary stria

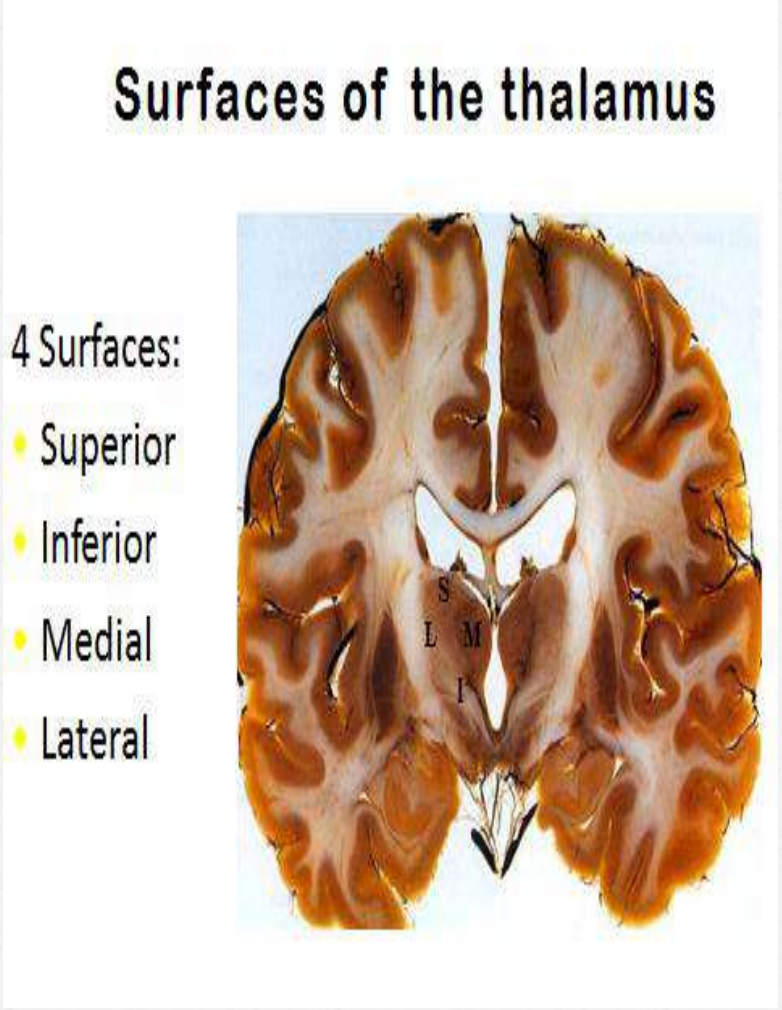
meets the stria from the other thalamus to form

habenular commissure

* The habenular nuclei are involved in :

pain processing, , nutrition, stress responses

reproductive behaviour, and sleep –wake cycles



Thalamus

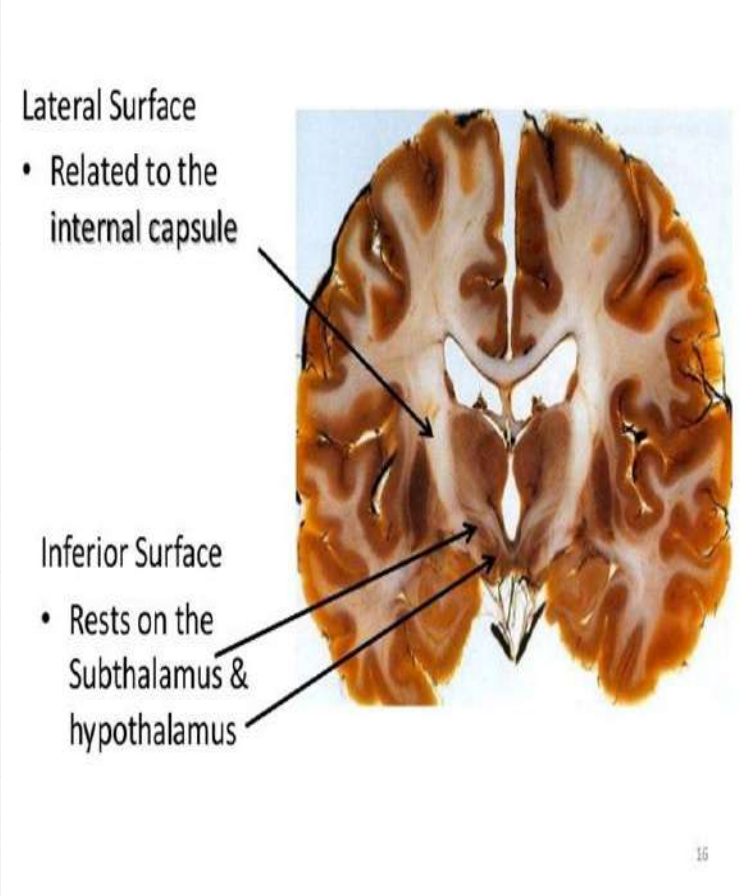
Lateral surface

related to the posterior limb of internal capsule

Inferior surface (ventral)

lie on subthalamus and hypothalamus.

It is continuous with the tegmentum of the midbrain.



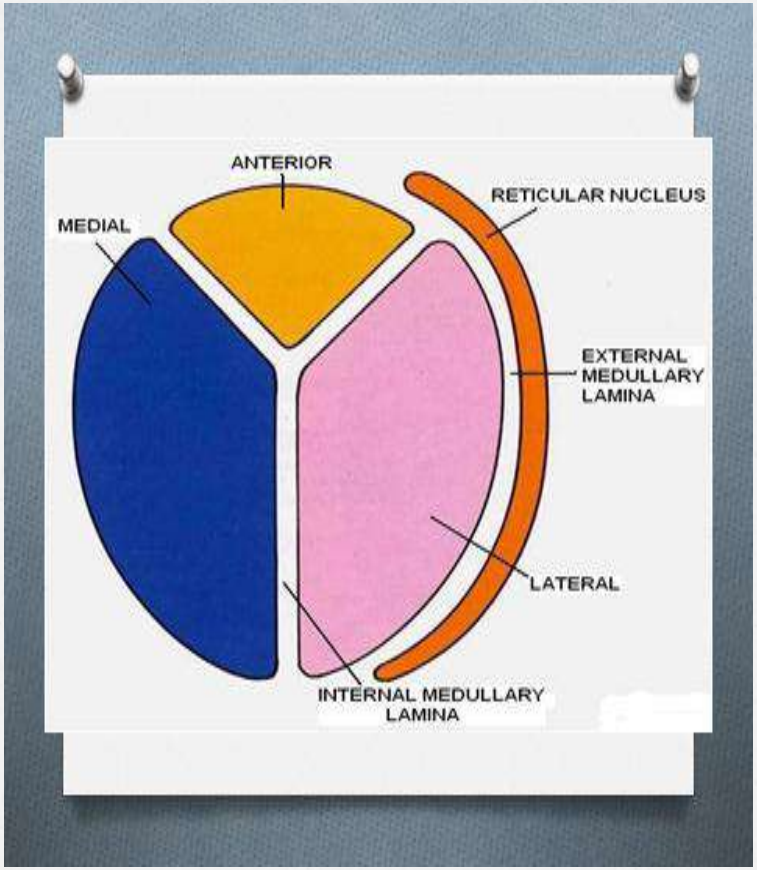
Thalamic nuclei
anatomical division

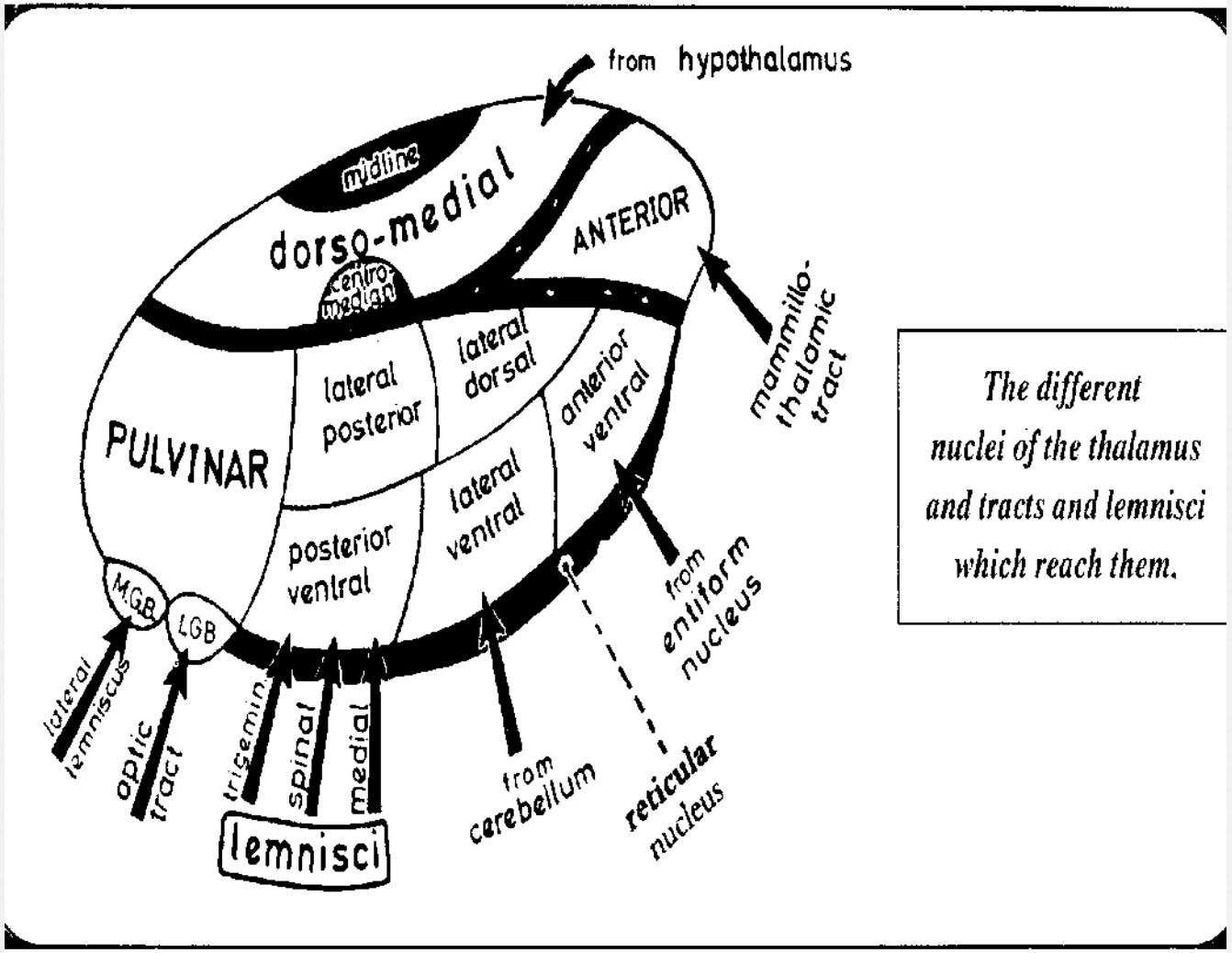
- y- shaped sheet of white matter called Internal medullary lamina divides the thalamus into three parts

- Anterior
- Medial
- Lateral

Each part contains

- several **nuclei**





The different nuclei of the thalamus and tracts and lemnisci which reach them.

- Anterior part: nuclei

lie between 2 limbs of internal medullary lamina.

Contain anterior thalamic nuclei

Receive fibers from mammillary body

- Concerned with emmotion and recent memory

Medial part :nuclei

a. midline nuclei = small

b. Centro medial nuclei = small part next to internal medullary lamina

c. Dorso medial nuclei = large

- concerened with integration of sensory information

Olfactory sensation

Emmotional feeling etc

lateral part: nuclei

Divided by imaginary line into

Ventral tier = below

3 nuclei in cranio caudal sequence

a. ventral anterior n.

b. ventral lateral n

c. Ventral posterior n. With 2 parts

1. lateral part = *PosteroLateral Ventral N* (PLV N)**

2. med ial part = *Posteromedial Ventral N* (PMV N)

above imaginary line

Dorsal part: 2 nuclei

1. lateral dorsal n
2. lateral posterior n
   pulvnar

Other thalamic nuclei

Posterior =pulvnar

Medial geniculate body

Concerned with

auditory relay

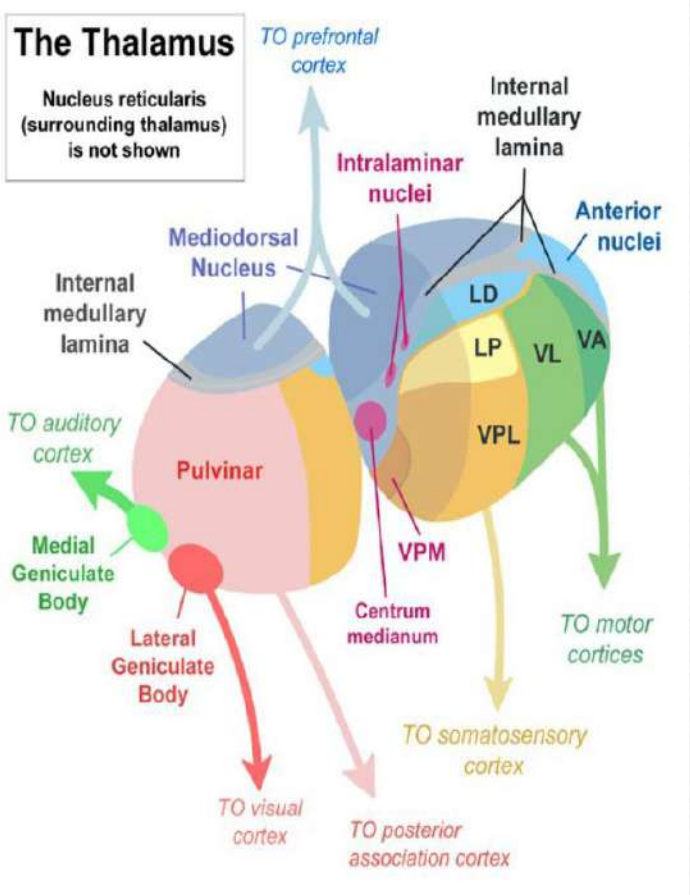
through **inferior colliculus**

Lateral geniculate body

Concerned with

visual relay

through **superior colliculus**



.Functional classification of thalamus:

Based on :

Relation ship between thalamus and cerebral cortex

(thalamo cortical projections)

1. nuclei of specific thalamocortical projection
2. nuclei of non-specific thalamo cortical projections

Functions of thalamus

Thalamus has 4 basic functional roles:

Sensory

All sensory information (except olfaction) is relayed to the cortex via the thalamus

Centre for Visual reflexes (thalamus to cerebral cortex)

Centre for Auditory reflexes

Motor

Motor system outputs from the basal ganglia and cerebellum are relayed by the thalamus

Emotion/memory

The thalamus is part of the Papez circuit and helps to control some emotional and memory information going to limbic cortex (cingulate gyrus)

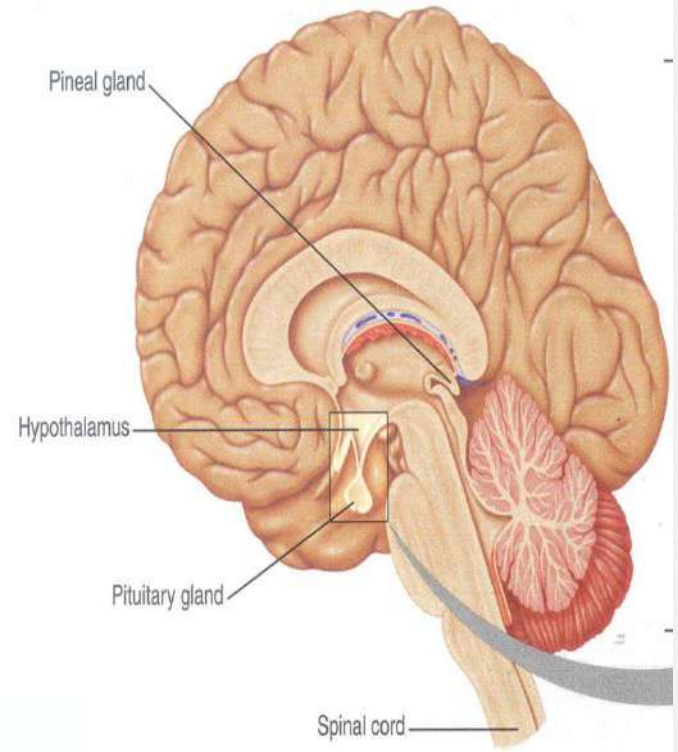
Vegetative

The thalamus has some intrinsic nuclei associated with alertness and arousal. Can be associated with disorders of consciousness

Hypothalamus

- *Below thalamus
- *Extend from region of optic chiasma to caudal borders of mammillary body,
- * part of floor of 3rd ventricle
- * structures lie in interpeduncular fossa

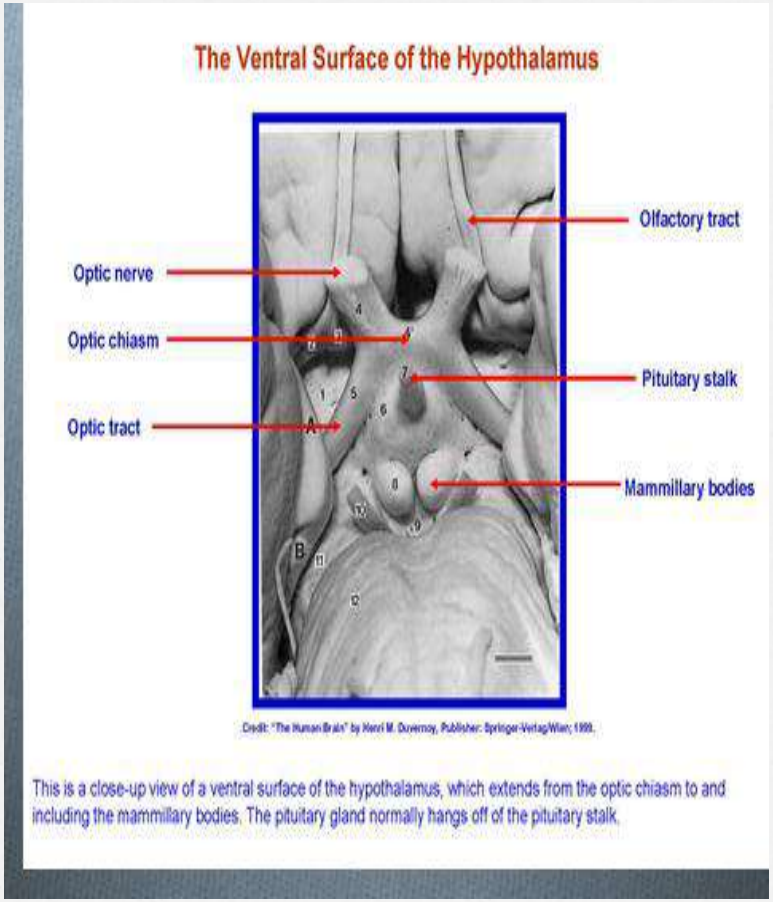
*Has no blood brain barrier



Structurs forming hypothalamus

Anterior to the hypothalamus is an area that, for functional reasons, is often included in the hypothalamus, it is referred to as the **preoptic area**. extend from optic chiasma to anterior commissure.

1. **optic chiasma**
2. **Infundibulum**
3. **Tuber cinereum**
4. **mamillary bodies**



Hypothalamic nuclei:

Nuclei:

Lateral zone::

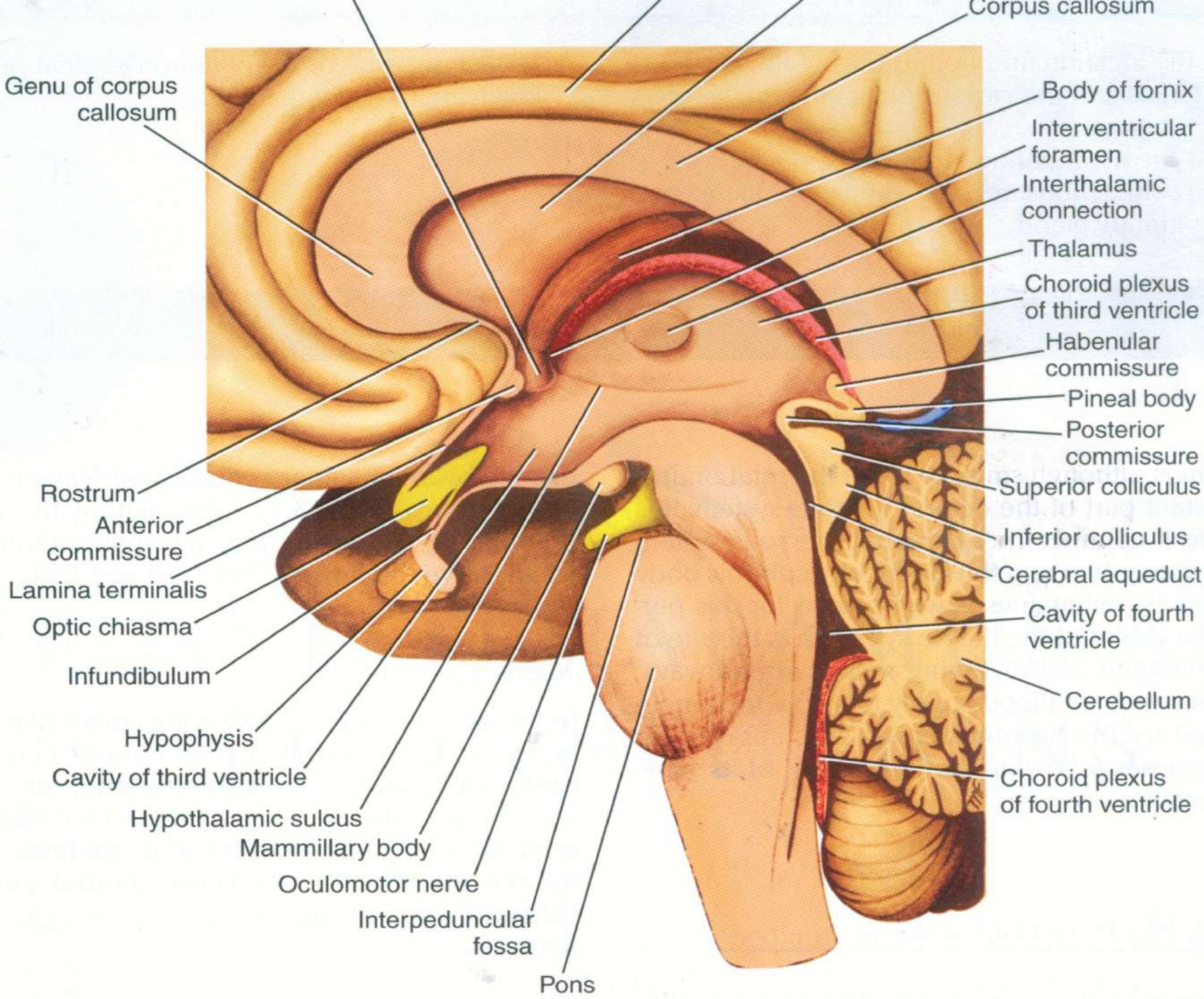
From anterior to posterior

1. Part of pre optic n.
2. part of supra chiasmatic n.
3. Supra optic n.
4. Lateral n.
5. Tubero mammillary n.
6. Lateral tuberal n.

Medial zone;

1. Part of preoptic n.
2. anterior n .
3. Part of suprachiasmatic n.
4. Paraventicular n.
5. Dorsomedial n.
6. Ventromedial n. infundibular n.

* Posterior n.


Corpus callosum
Genu of corpus callosum
Body of fornix
Interventricular foramen
Interthalamic connection
Thalamus
Choroid plexus of third ventricle
Habenular commissure
Pineal body
Posterior commissure
Superior colliculus
Inferior colliculus
Cerebral aqueduct
Cavity of fourth ventricle
Cerebellum
Choroid plexus of fourth ventricle
Rostrum
Anterior commissure
Lamina terminalis
Optic chiasma
Infundibulum
Hypophysis
Cavity of third ventricle
Hypothalamic sulcus
Mammillary body
Oculomotor nerve
Interpeduncular fossa
Pons

Functions

- **The hypothalamus receives information from the rest of the body through:**

(1) nervous connections,

(2) the bloodstream.

(3) cerebrospinal fluid.

- ****It maintains the internal environment of the body through
- 3 systems
  ***Autonomic NS**
- ***Endocrine system**
- ***Limbic system**

1- Regulates blood pressure, rate and force of heartbeats , digestive tract motility, rate and depth of breathing, and many other visceral activities

2- involved with perception of pleasure, fear, and rage

3- Controls mechanisms needed to maintain normal body temperature

.

4- Regulates feelings of hunger and satiety

5- Regulates sleep and the sleep cycle .

6.Releasing hormones /ant- pituitary

Epithalamus:

Above thalamus

3rd most dorsal part of diencephalon . It consists of

Fornix

Habenular nuclei + commissure = habinular trigone

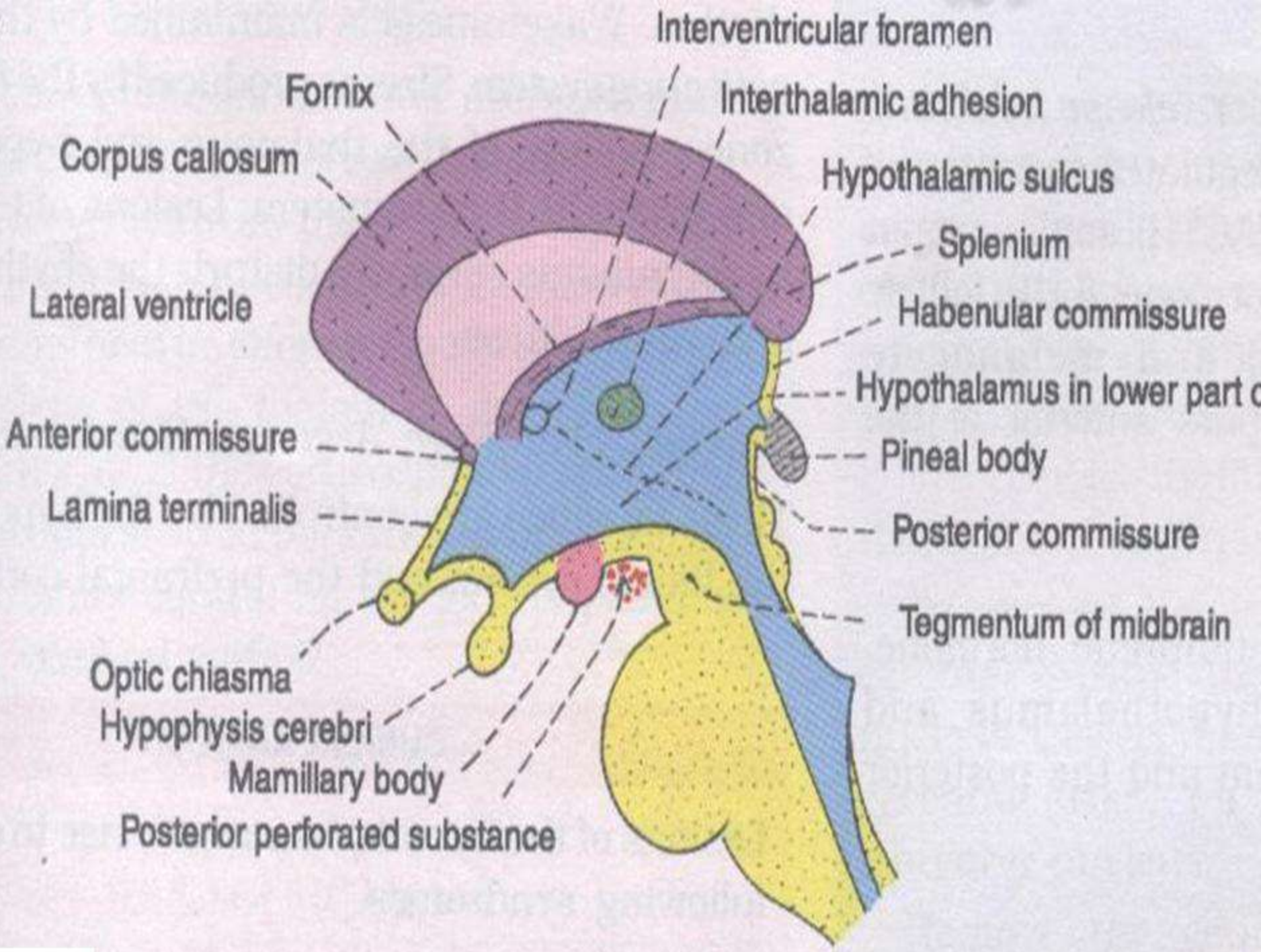
Pineal gland

Posterior commissure (concerned with bilateral pupillary reflex

- 2 habenular trigones + pineal body

Each habinular trigone contains

habinulear nuclei which are relay station for smell pathway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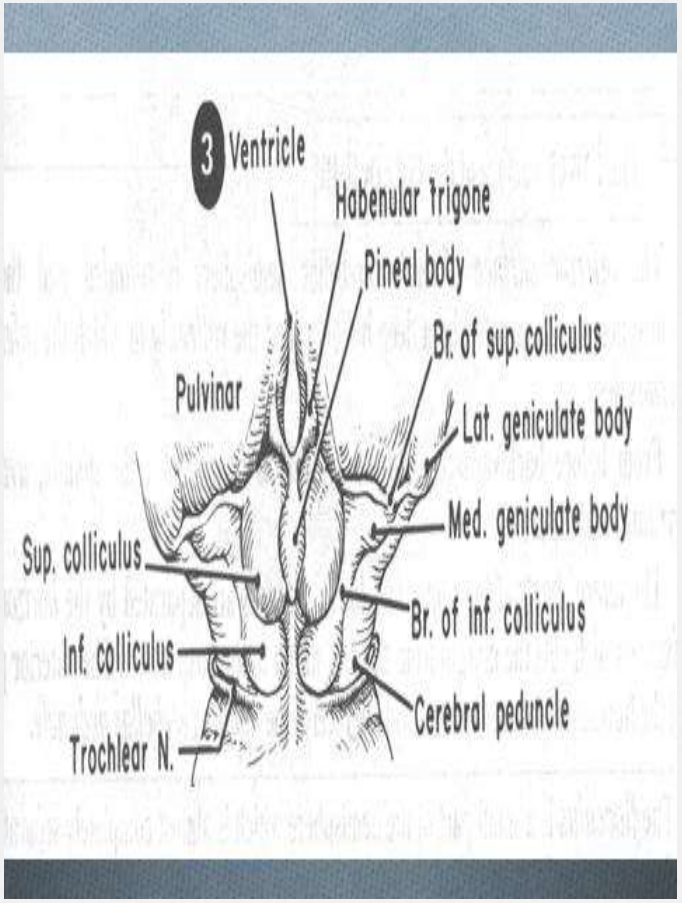
Lamina terminalis
Posterior commissure
Tegmentum of midbrain
Optic chiasma
Hypophysis cerebri
Mamillary body
Posterior perforated substance

Pineal body

- Unpaired midline structure
- Just rostral to superior colliculi
- Looks like a pine cone (“pineal”)
- Endocrine gland related to seasonal light cycles
- Secretes melatonin
- Night time sleep regulation
- Calcified at old age



Subthalamus

It lies between the thalamus and tegmentum of the midbrain

on tegmentum

Nuclei divided into: anterior and posterior

Posterior part:

contain 5 bundles ascend from below to thalamus

1. medial lemniscus
2. spinal lemniscus
3. trigeminal lemniscus
4. reticulothalamic tract
5. Sup -cerebellar peduncle.

Anterior part:

5 structures:

Nuclei are:

1. upper end of red n.
2. upper end of substantia nigra
3. subthalamic n

Small group of cells = zona incerta

2 bundles

1.Fasciculus lenticularis

2. ansa lenticularis

Metathalamus

- medial and lateral geniculate body which
- are attached to inferior surface of posterior
- part of thalamus = pulvnar
- - thalamic centers of hearing (auditary) and vision

Lesions of diencephalon cause:

- Poor temperature control.
- Abnormal appetite
- Lack of ADH causing polyuria and polydypsia.
- These lesions rarely ever occur alone. usually in conjucatiobn with cerebral lesions.