بسم الله الرحمن الرحيم

Diencephalon Anatomy

Comprehensive study sheet

Based on the uploaded lecture slides of Dr. Maha ELBeltagy

اللهم أعنا على ذكرك و شكرك و حسن عبادتك

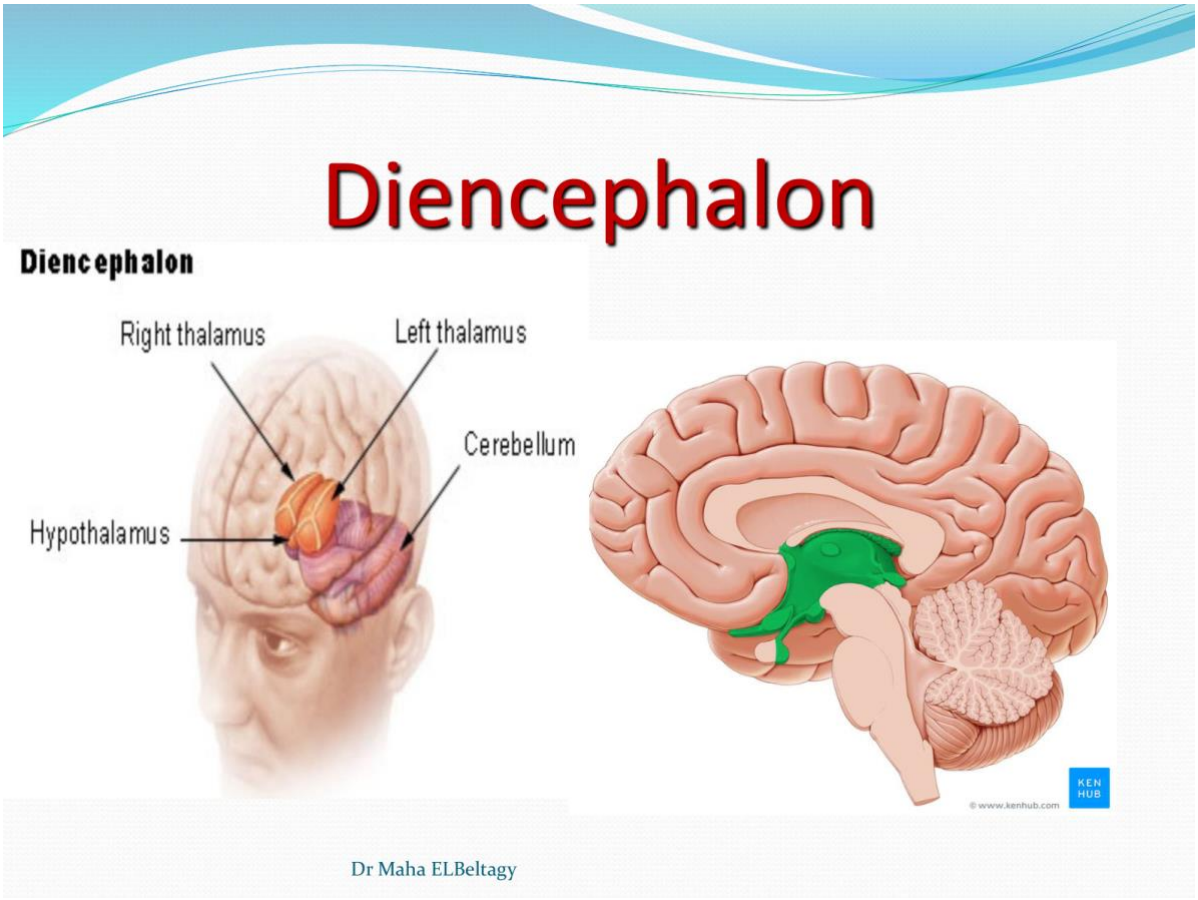


Figure 1. Overview of the diencephalon from the lecture slides (p. 3).

What matters	Midline forebrain above the midbrain; derived from prosencephalon; surrounds the third ventricle; divides into a dorsal part (thalamus, epithalamus, metathalamus) and a ventral part (hypothalamus, subthalamus).

1. Diencephalon: overview and subdivision

- Located near the midline of the brain, above the midbrain.
- Developed from the forebrain vesicle (prosencephalon).
- More primitive than the cerebral cortex and lies under it.
- The cavity of the third ventricle divides the diencephalon into two halves.
- The hypothalamic sulcus extends from the interventricular foramen to the cerebral aqueduct and divides each half into dorsal and ventral parts.

Division	Components	Take-home message
Dorsal	Thalamus, epithalamus, metathalamus	Upper diencephalon around the 3rd ventricle
Ventral	Hypothalamus, subthalamus	Lower diencephalon and floor-related structures

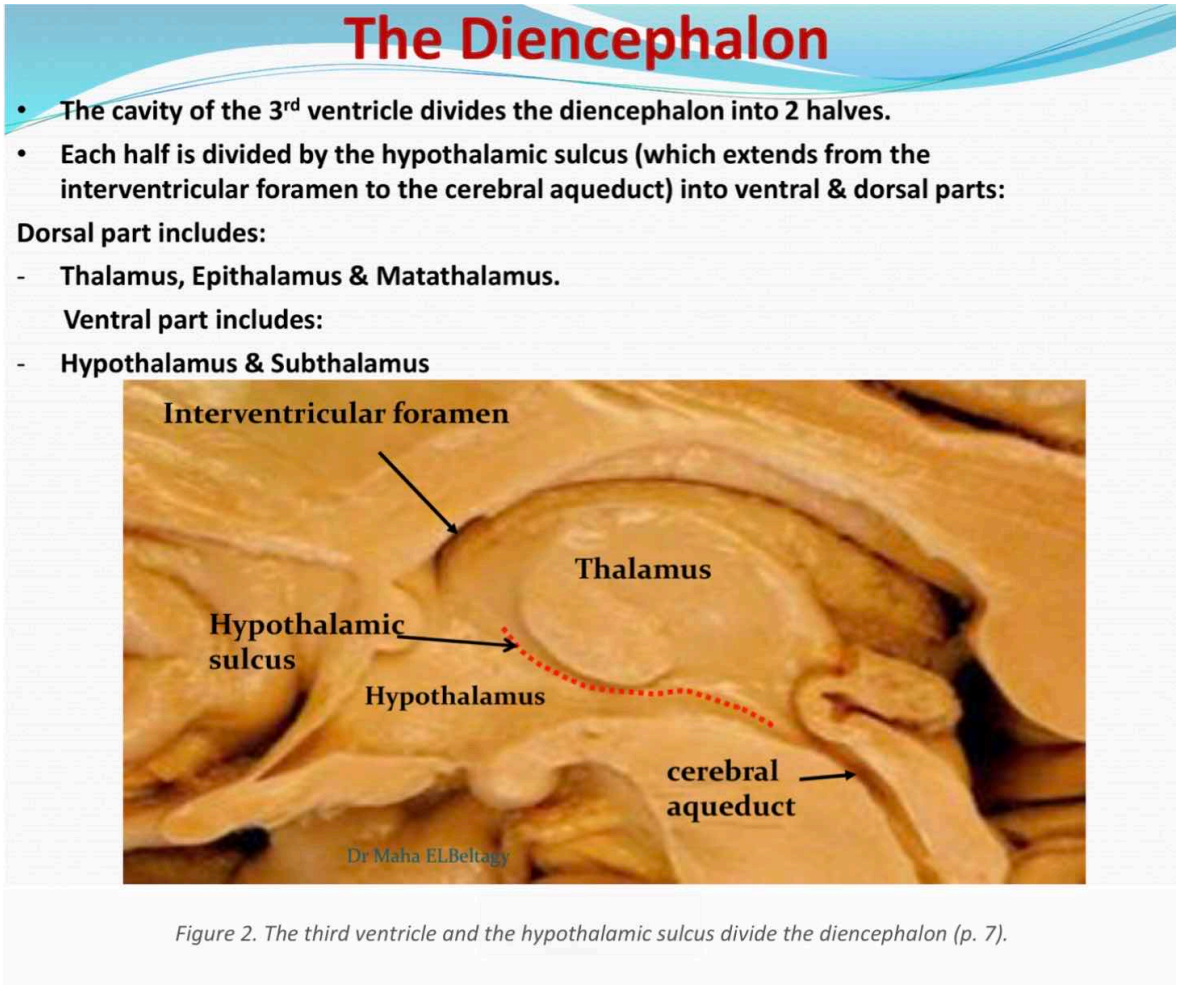


Figure 2. The third ventricle and the hypothalamic sulcus divide the diencephalon (p. 7).

2. Thalamus

- Large egg-shaped mass of gray matter.
- Main sensory relay station for the cerebral cortex.
- Forms part of the lateral wall of the third ventricle and part of the floor of the body of the lateral ventricle.
- The two thalami are connected by the interthalamic adhesion.

Surface/end	Relation
Anterior end	Narrow; forms the posterior boundary of the interventricular foramen.
Posterior end	Pulvinar overhanging the medial and lateral geniculate bodies.
Upper surface	Floor of the body of the lateral ventricle.
Medial surface	Lateral wall of the third ventricle.
Lateral surface	Caudate nucleus above and lentiform nucleus below, separated by the posterior limb of the internal capsule.
lower surface	Hypothalamus anteriorly; subthalamus posteriorly.

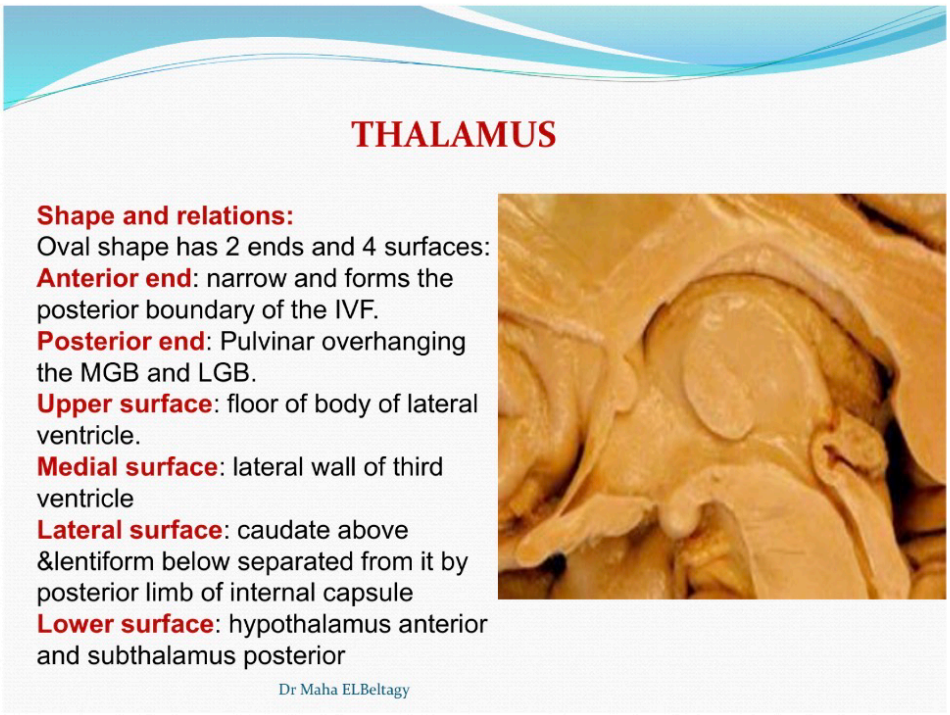


Figure 3. Thalamic shape and relations (p. 10).

3. Thalamic nuclei and functions

- Classification used in the slides: lateral, medial, anterior, posterior, metathalamic, intralaminar, and reticular groups.
- Broadly, the thalamus relays sensory input, motor input, and limbic information, while also contributing to alertness and attention.

Group	Key nuclei	Main role
Anterior	Anterior nuclei	Emotion and memory
Medial	Dorsomedial nucleus	Integration of somatic, visceral, and olfactory information
Lateral - ventral	VA, VL, VP	Motor and sensory relay
Lateral - dorsal	LD, LP, pulvinar	Association with the cortex
Metathalamus	MGB, LGB	Hearing and vision
Intralaminar / reticular	Intralaminar nuclei, reticular nucleus	Alertness and modulation

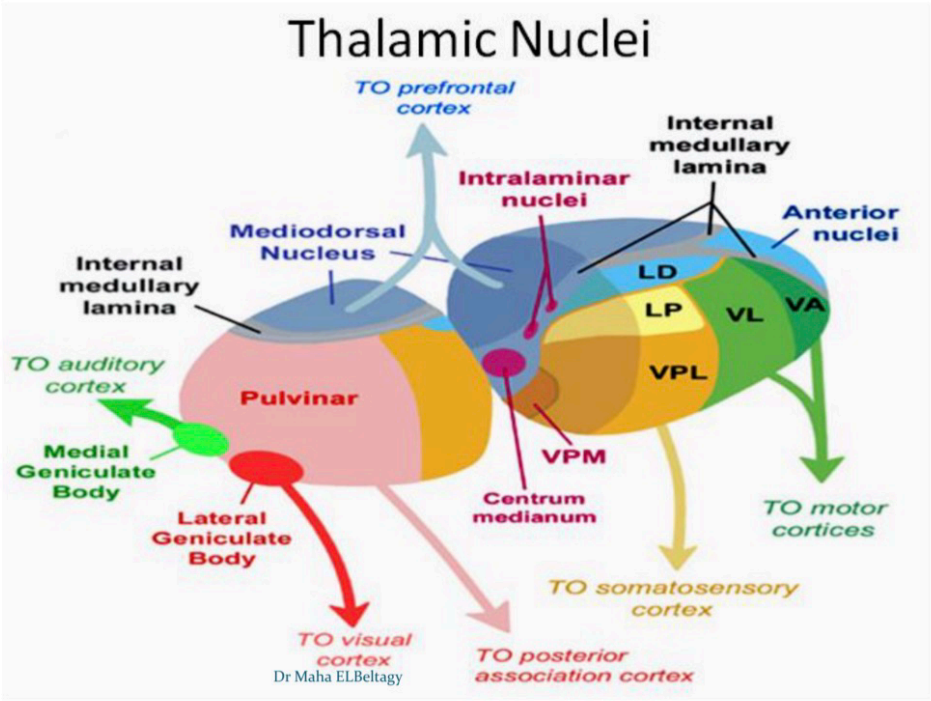
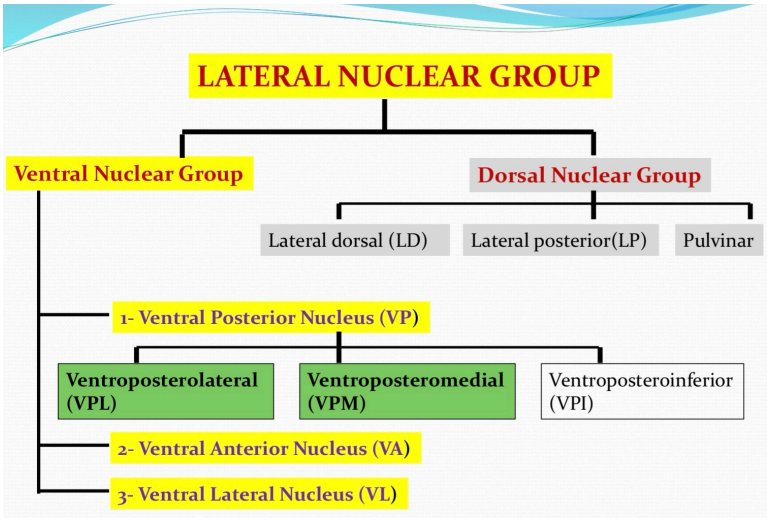


Figure 4. Thalamic nuclei map and major connection targets (p. 12).



Nucleus	Afferent	Efferent	Function
Anterior	Mammillothalmic tract,cingulate gyrus, hypothalamus	Cingulate gyrus,hypothalamus	Emotion and memory
Dorsomedial	Prefontal cortex, hypothalamus	Prefontal cortex, hypothalamus	Intergration of somatic,visceral ,olfaction
LD &LP	Cerebral cortex	Cerebral cortex	unknown
VA	Premotor cortex, BG	Premotor cortex, BG	Motor activity
VL	Premotor cortex,cerebellum	Premotor cortex,cerebellum	Motor activity
VPM	Trigiminal lemniscus	Area 3,1,2	general sensation
VPL	Medial&spinal lemnesci	Area 3,1,2	general sensation
Intralaminar	Reticular formation	Cerebral cortex	Alertness
Reticular	Cerebral cortex	Other thalamic nuclei	Regulate thalamus
MGB	Lateral lemniscus	Superior temporal gyrus	hearing
LGB	Optic tract	Visual cortex	Vision

Figure 5. Thalamic nuclei summary table from the slides (p. 17).

High-yield nuclei details

Nucleus	Afferent	Efferent	Function
Anterior	Mammillothalamic tract, cingulate gyrus, hypothalamus	Cingulate gyrus, hypothalamus	Emotion and memory
Dorsomedial	Prefrontal cortex, hypothalamus	Prefrontal cortex, hypothalamus	Integration of somatic, visceral, olfactory input
LD & LP	Cerebral cortex	Cerebral cortex	Association
VA	Premotor cortex, basal ganglia	Premotor cortex, basal ganglia	Motor activity
VL	Premotor cortex, cerebellum	Premotor cortex, cerebellum	Motor activity
VPM	Trigeminal lemniscus	Area 3,1,2	General sensation
VPL	Medial and spinal lemnisci	Area 3,1,2	General sensation
Intralaminar	Reticular formation	Cerebral cortex	Alertness
Reticular	Cerebral cortex	Other thalamic nuclei	Regulates thalamus
MGB	Lateral lemniscus	Superior temporal gyrus	Hearing
LGB	Optic tract	Visual cortex	Vision

4. Thalamic radiations

- Anterior thalamic radiation: anterior nucleus -> frontal lobes and cingulate gyrus; ascends in the anterior limb of the internal capsule.
- Superior thalamic radiation: ventral posterior nucleus -> postcentral gyrus; ascends in the posterior half of the posterior limb of the internal capsule.
- Optic radiation: LGB -> occipital lobe (visual cortex); passes through the retrolentiform part of the internal capsule.
- Auditory radiation: MGB -> auditory area in the superior temporal lobe; passes through the sublentiform part of the internal capsule.

Radiation summary

Radiation	Origin -> destination	Route	Modality
Anterior thalamic	Anterior nucleus -> frontal lobes/cingulate gyrus	Anterior limb	Association
Superior thalamic	VP -> postcentral gyrus	Posterior half of posterior limb	Somatosensory
Optic	LGB -> occipital visual cortex	Retrolentiform	Vision
Auditory	MGB -> superior temporal lobe	Sublentiform	Hearing

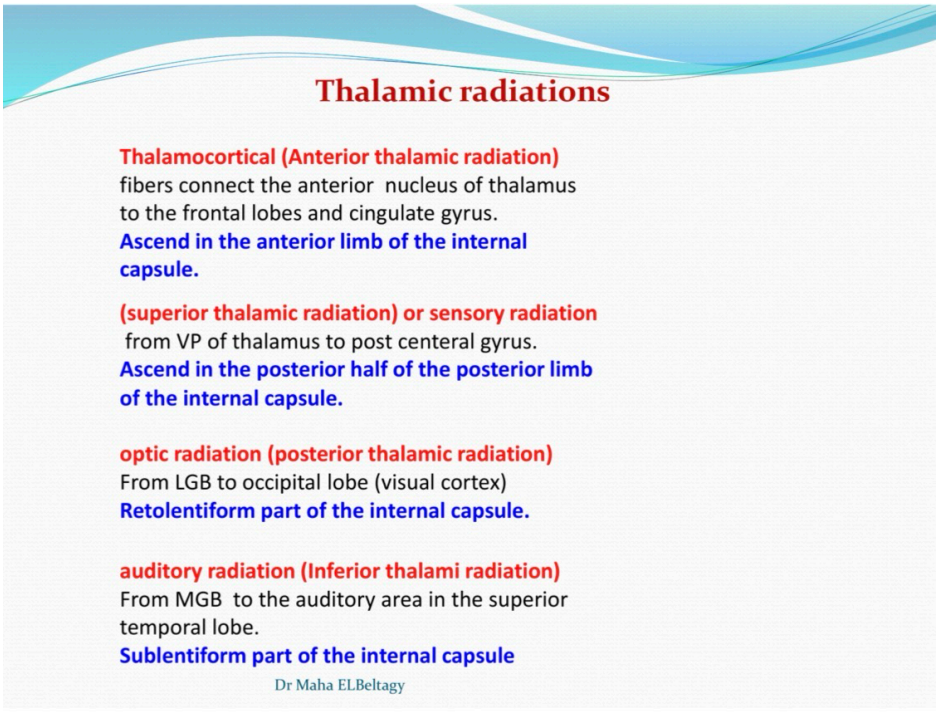


Figure 6. Thalamic radiations (p. 18).

5. Hypothalamus

- Part of the diencephalon.
- Extends from the optic chiasma to the mammillary bodies.
- Forms the floor of the third ventricle.
- Preoptic area: from the optic chiasma to the lamina terminalis and anterior commissure.
- Bounded laterally by the internal capsule.

Major constituents	Functions
Mammillary bodies	Homeostasis: food intake, water and electrolyte balance, temperature regulation, circadian rhythm
Tuber cinereum and infundibulum	Endocrine control via the pituitary gland
Nervous tissue adjacent to optic chiasma	Autonomic control
Preoptic region adjacent to lamina terminalis	Limbic function: memory and emotions

Function of the hypothalamus

- Homeostasis: food intake, water and electrolyte balance, temperature regulation, and circadian rhythm.
- Endocrine control via the pituitary gland (growth, reproduction, stress hormones).
- Autonomic control: sympathetic and parasympathetic responses.
- Limbic function: memory and emotions.

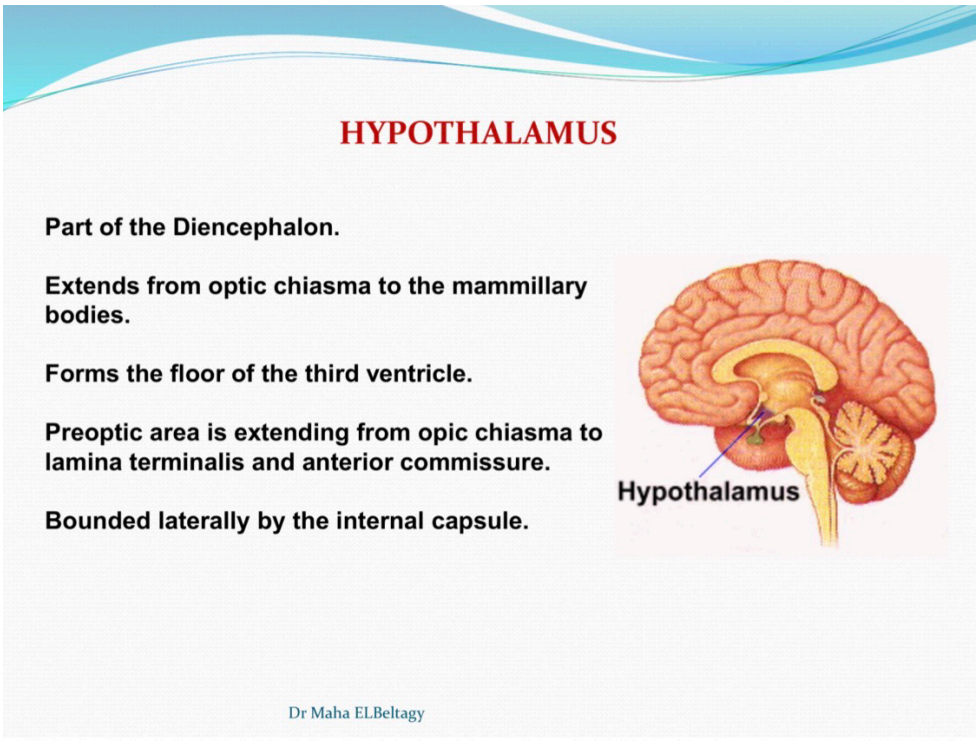
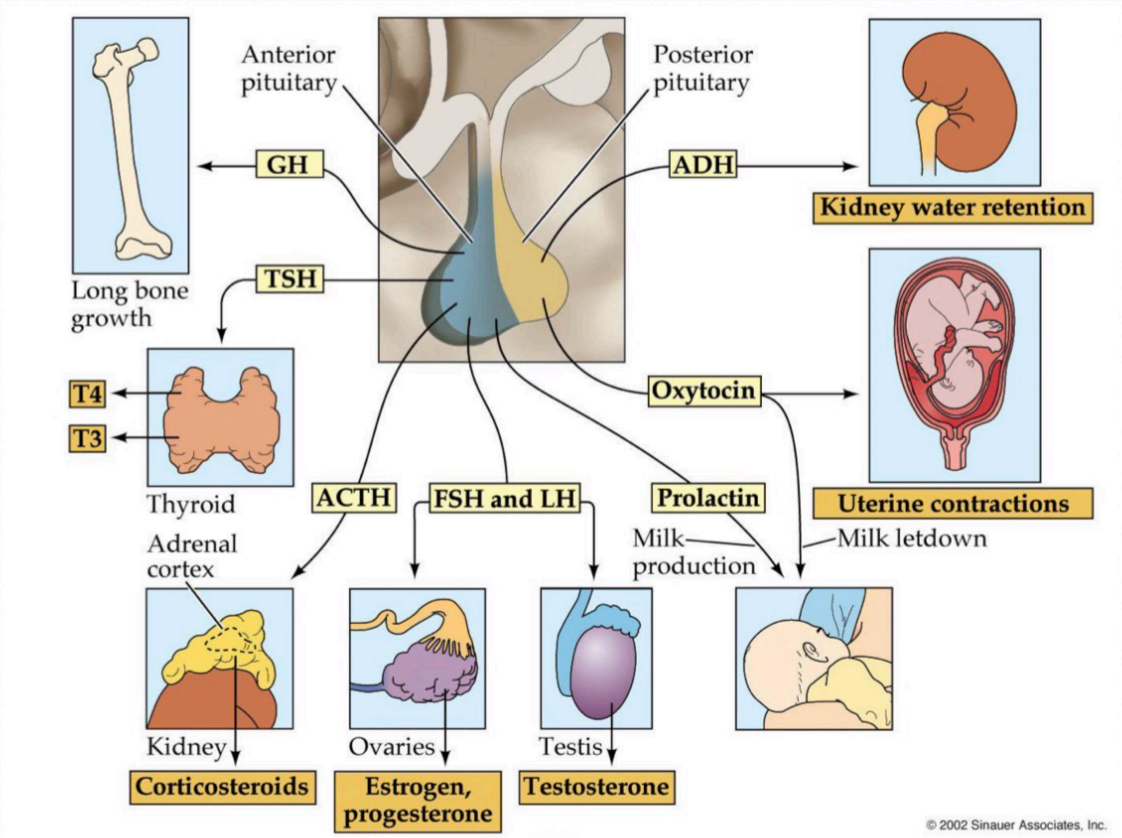


Figure 7. Hypothalamic location and boundaries (p. 20).

Function of the Pituitary



Epithalamus

- Major constituents: habenular nucleus (medial and lateral), habenular commissure, and pineal gland.
- Connects the limbic system and other parts of the brain.
- The pineal gland secretes melatonin.
- It contributes to regulation of pituitary function through hypothalamic pathways.

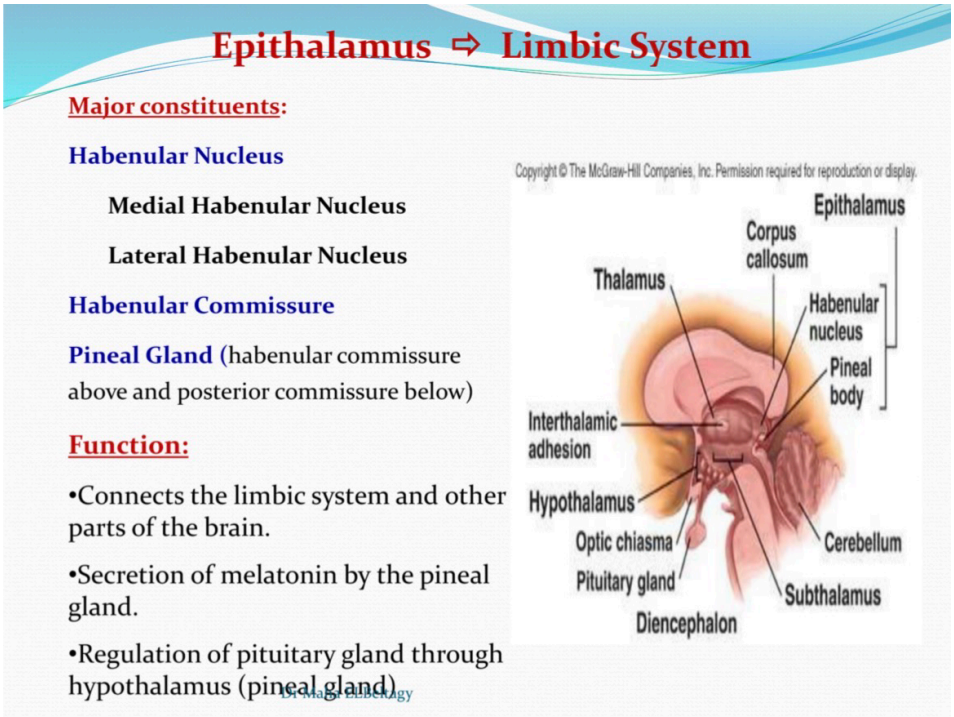


Figure 8. Epithalamus and pineal region (p. 24).

كان ممكن أفضل، كان ممكن تصبر
لكن يا خسارة تذكرتي قديمة

Metathalamus (geniculate bodies)

- Placed under the pulvinar of the thalamus.
- Medial geniculate body (MGB): receives afferents from the lateral lemniscus and inferior colliculus via the inferior brachium; sends auditory radiation through the sublentiform part of the internal capsule to the superior temporal gyrus.
- Lateral geniculate body (LGB): receives the optic tract; sends optic radiation through the retrolentiform part of the internal capsule to the visual cortex in the occipital lobe.
- The LGB is the third-order neuron in the visual pathway.

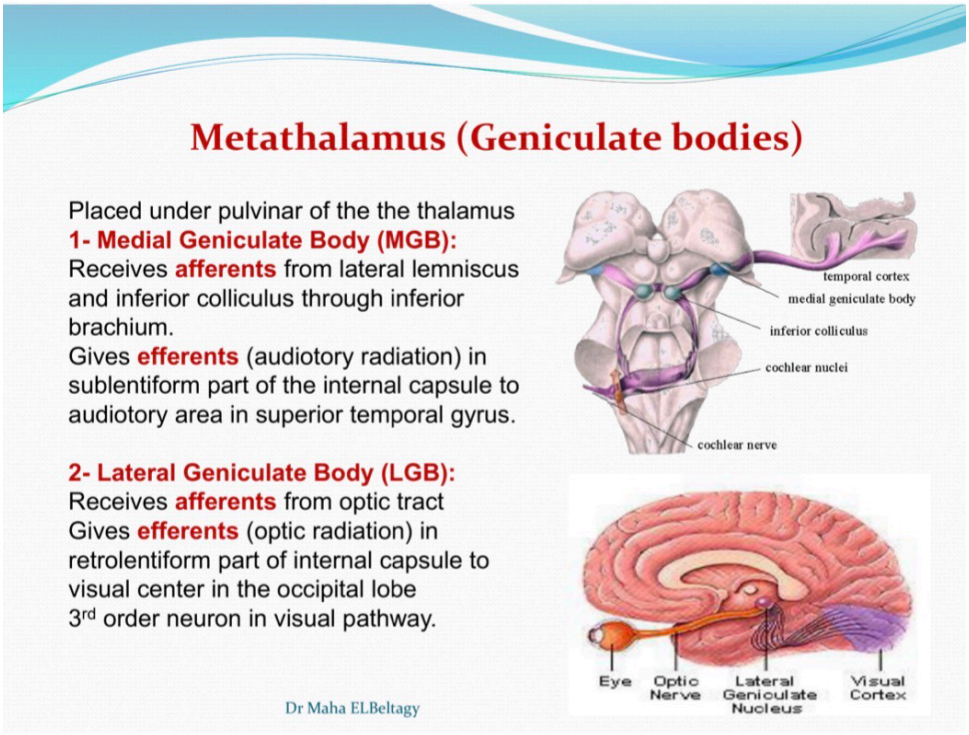


Figure 9. Metathalamus and geniculate bodies (p. 25).

6. Final quick revision

Diencephalon = midline forebrain above the midbrain. Divided by the third ventricle. Dorsal part: thalamus, epithalamus, metathalamus. Ventral part: hypothalamus, subthalamus. Thalamus = sensory relay + motor relay + limbic relay. Key nuclei: VA, VL, VPM, VPL, MGB, LGB.	Hypothalamus = homeostasis, endocrine control, autonomic control, limbic function. Extends from optic chiasma to mammillary bodies. Forms the floor of the third ventricle. Epithalamus = habenula + pineal gland. Metathalamus = MGB and LGB.

Built from the uploaded lecture slides (pages 3-25).

Thanks for using this sheet.
If you found it helpful, please share it

لم تستقبل الأهداف يا إنريكي، ولك الأسبقية بهدف، ولك المرتدات في الثاني،
يمشي مييييييسي،
يا بابا،
يا بابا يا بابا يا بابا،
الأرجنتيني، الأرجنتيني هو بابا