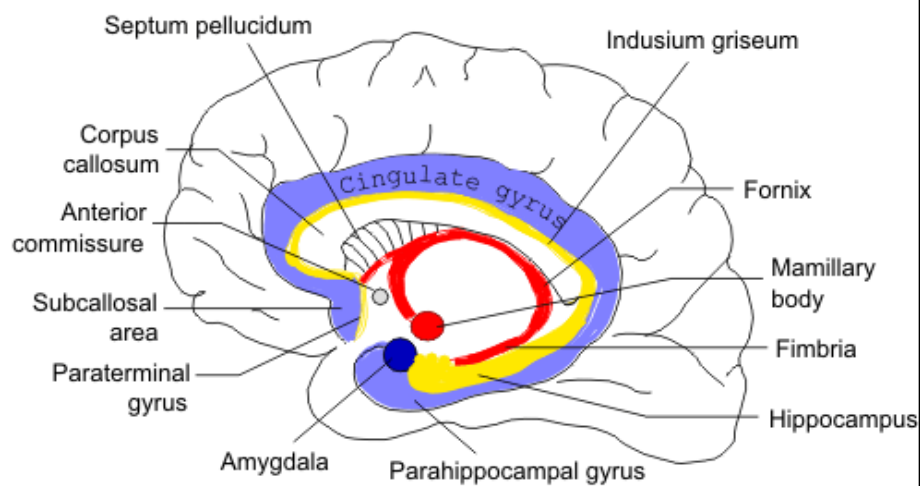


## Anatomy for Dentistry



Dr. Mohammad Alsalem, PhD

## The Limbic System



## Function



- Instinct (Hypothalamus)
- Memory (Hippocampus)
- Emotions (Hippocampus, Amygdala, Prefrontal cortex, septal areas)

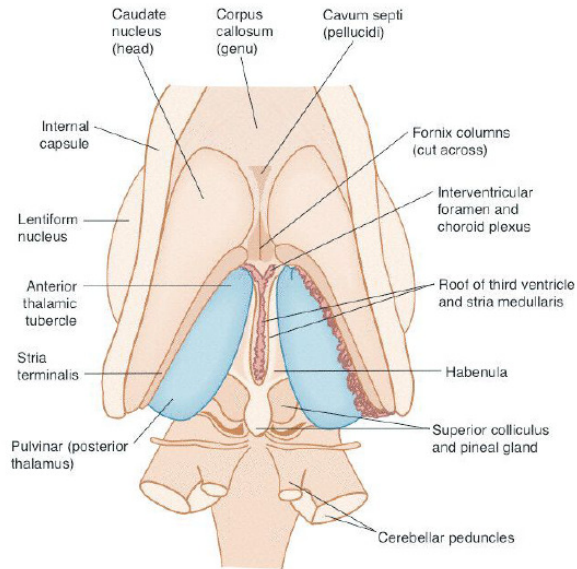
## Clinical points



- Lesion of the hippocampus results in (**anterograde amnesia**)
  - The individual is unable to store long-term memory
  - Memory of remote past events before the lesion developed is unaffected
- Hippocampus is the first area to show damage in Alzheimer disease
- **Kluver-Bucy syndrome:** bilateral removal of amygdala
  - Docility
  - Show no evidence of fear or anger
  - increased sexual activity
  - Hyperphagia

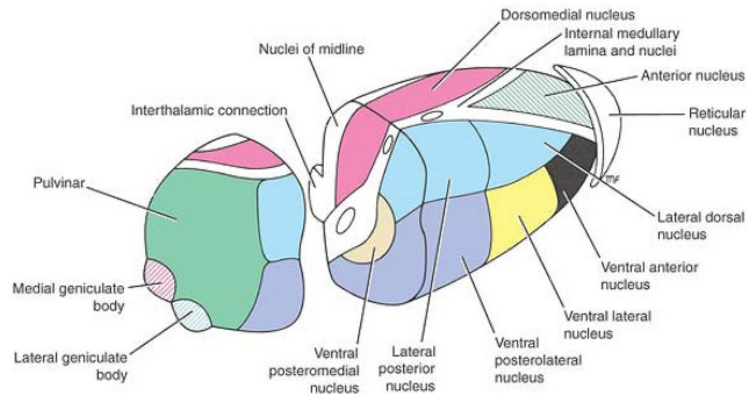
## Thalamus

- large, ovoid, gray mass of nuclei
- The anterior end: narrow and rounded and forms the posterior boundary of the **interventricular foramen**.
- The posterior end: expanded to form the **pulvinar**
- The inferior surface is continuous with the tegmentum of the midbrain.
- The medial surface of the thalamus forms part of the lateral wall of the third ventricle (**interthalamic connection**)



## Thalamus

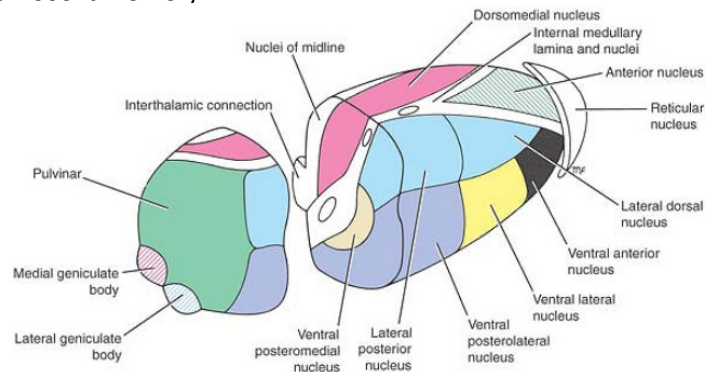
- **Stratum zonale**: thin layer of white matter, covering thalamus on its superior surface
- **External medullary lamina**: lateral surface
- **Internal medullary lamina**: vertical sheet of white matter (Y shape) which divide it into:
  - **Anterior part:**
  - **Medial part**
  - **Lateral part**



## Thalamus

- **Anterior thalamic nuclei:**

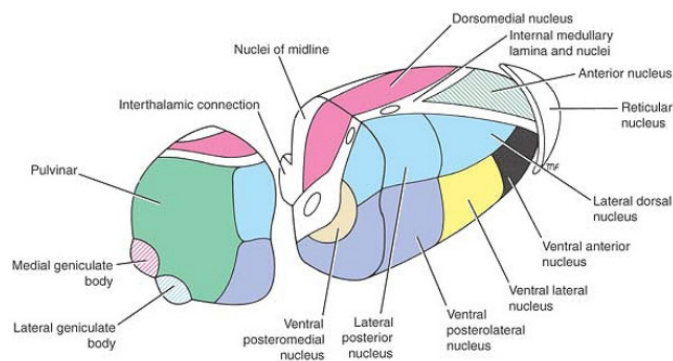
- **Location and connection:** bordered by the limbs of the internal lamina. receives fibers from the mamillary bodies via the mamillothalamic tract and projects to the cingulate cortex of the cerebrum
- **Function:** limbic system, concerned with emotional tone and the mechanisms of recent memory.



## Thalamus

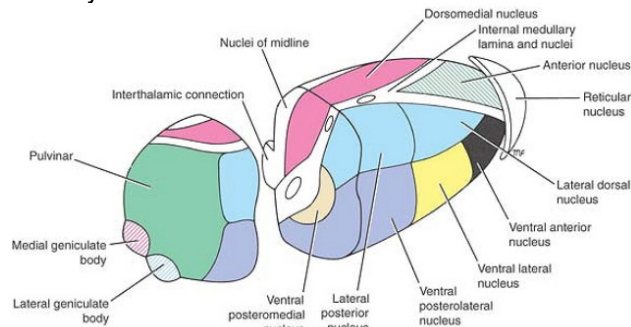
- **Dorsomedial nucleus:**

- **Location and connection:** (Medial part) connections with:
  - The prefrontal cortex
  - The hypothalamic nuclei
  - All other groups of thalamic nuclei
- **Function:** integration of sensory information (somatic, visceral, and olfactory information (emotional feelings))



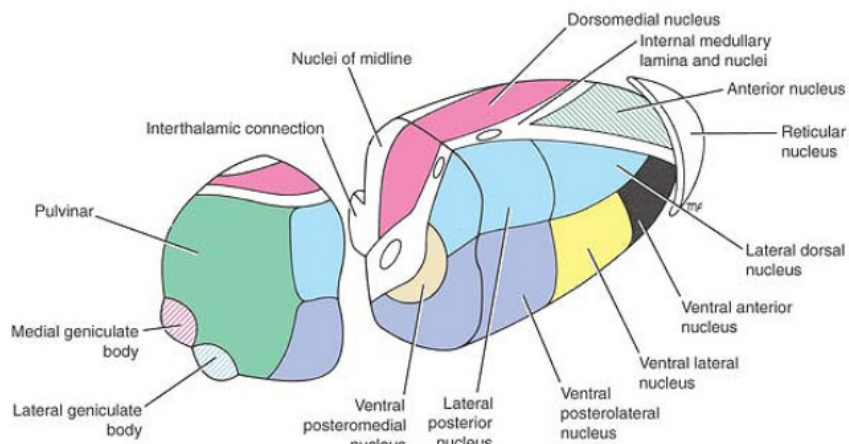
## Thalamus

- **Ventral anterior and Ventral lateral:**
  - **Location and connection:** (lateral part) connections with:
    - Reticular formation
    - substantia nigra
    - corpus striatum
    - premotor cortex
    - other thalamic nuclei
  - **Function:** Influences activity of motor cortex



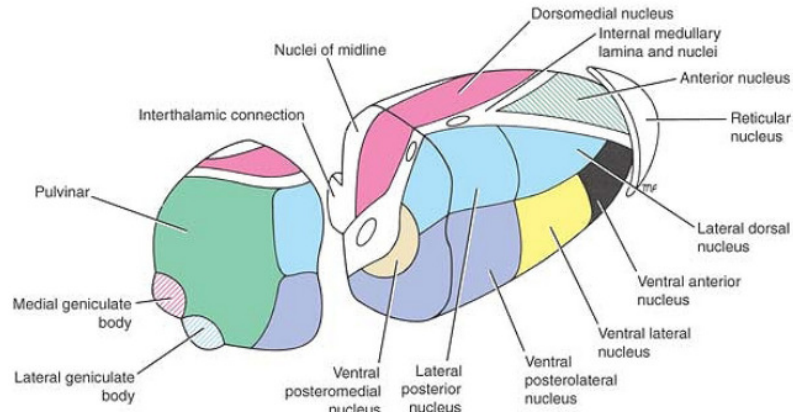
## Thalamus

- **Lateral geniculate body:**
  - **Location:** undersurface of the pulvinar of the thalamus
  - **Afferent connection:** Optic tract.
  - **Efferent connection:** Optic radiation to visual cortex of occipital lobe
  - **Function:** Visual information from opposite field of vision



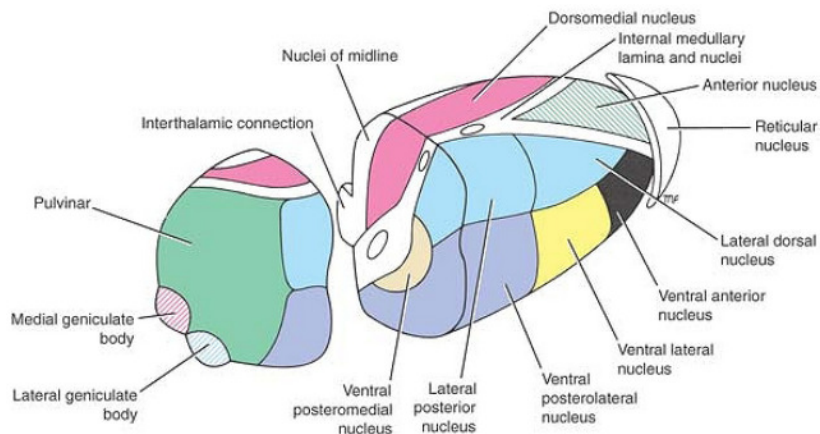
## Thalamus

- **Medial geniculate body:**
  - **Location:** posterior surface of the thalamus beneath the pulvinar
  - **Afferent connection:** inferior colliculus receives both ears but predominantly from the opposite ear.
  - **Efferent connection:** auditory cortex of the superior temporal gyrus.
  - **Function:** Hearing



## Thalamus

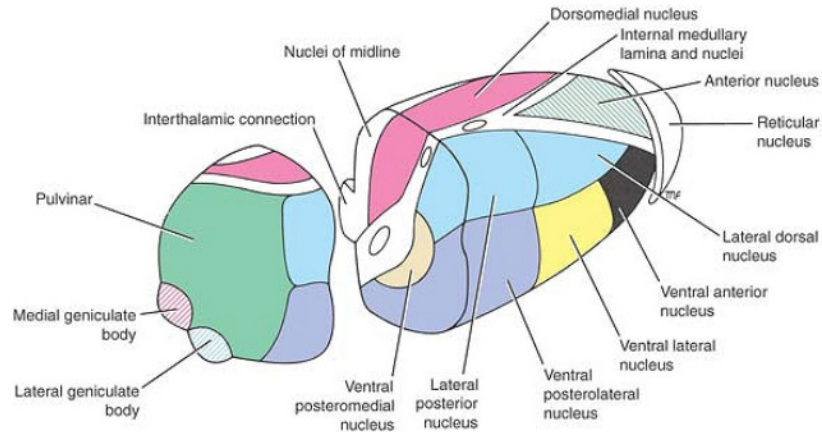
- **Ventral Posteromedial (VPM):**
  - **Location:** Lateral part
  - **Afferent connection:** Trigeminal lemniscus, gustatory fibers
  - **Efferent connection:** Primary Somatic sensory cortex
  - **Function:** Relays common sensations



## Thalamus

- **Ventral Posterolateral (VPL):**

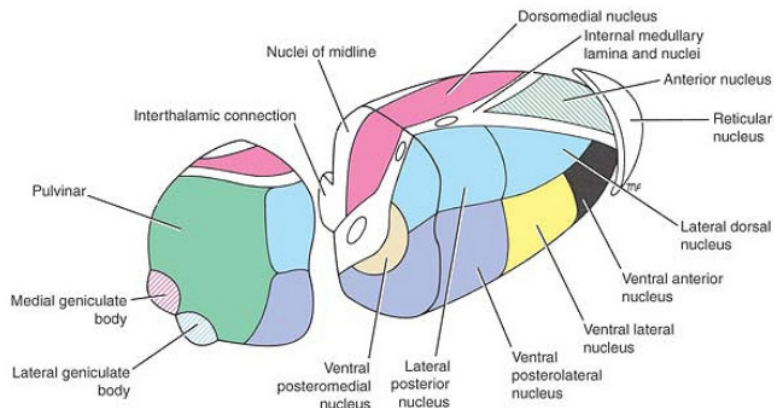
- **Location:** Lateral part
- **Afferent connection:** Medial and spinal lemnisci
- **Efferent connection:** Primary Somatic sensory cortex
- **Function:** Relays common sensations



## Thalamus

- **Reticular nucleus:**

- **Location:** between the external medullary lamina and the internal capsule
- **Afferent connection:** Cerebral cortex, reticular formation
- **Efferent connection:** other thalamic nuclei
- **Function:** cerebral cortex regulates thalamic activity???



## Lesions of the Thalamus



- **Damage to VPM and VPL:**
  - **Due to:** Usually thrombosis or hemorrhage of one of the arteries supplying the thalamus.
  - **Symptoms:** loss of all forms of sensation, including light touch, tactile localization and discrimination from the opposite side of the body
  - Vascular lesion of the thalamus may also involve the midbrain and internal capsule and produce extensive motor and sensory deficits. (Symptoms overshadowed)
- **Dejerine–Roussy syndrome (thalamic Pain):**
  - May occur as the patient is recovering from a thalamic infarct
  - Symptoms: Spontaneous pain occurs on the opposite side of the body.

## Lesions of the Thalamus

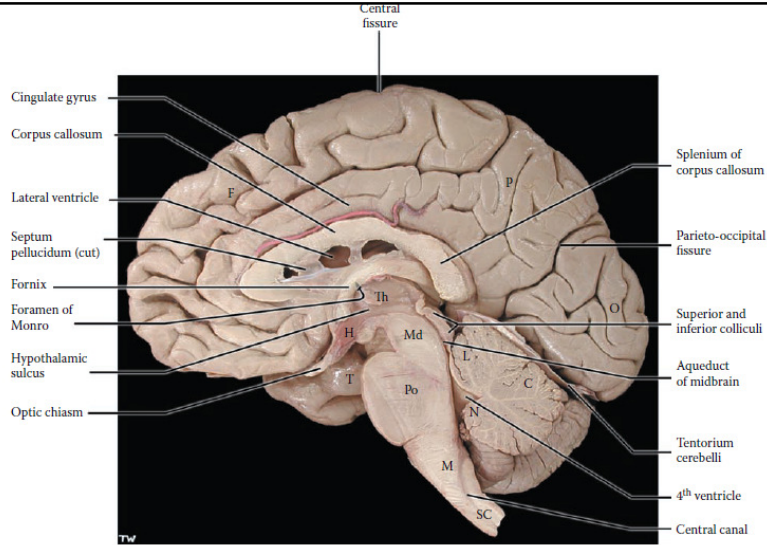


- **Abnormal Involuntary Movements:**
  - **Due to:** vascular lesions of the thalamus.
  - **Symptoms: Chorea** (involuntary movements, the extremities and twitching of the face) and **athetosis** (slow, involuntary, convoluted, writhing movements of the fingers, hands and toes)
  - Vascular lesion of the thalamus may also involve the neighboring caudate and lentiform nuclei (Symptoms overshadowed)
- **Thalamic hand:**
  - The wrist is flexed, the metacarpophalangeal joints are flexed, and the interphalangeal joints are extended.
  - Fingers can be moved but slowly



## Hypothalamus

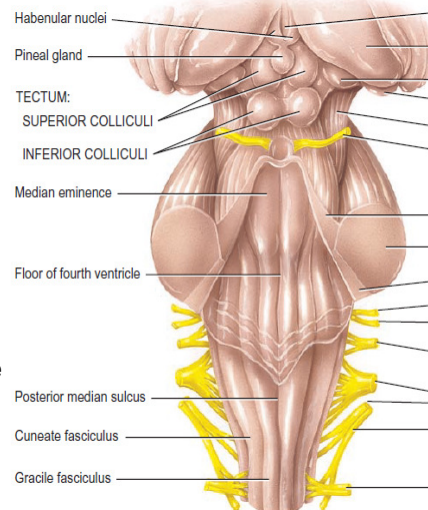
- Under the thalamus
- An important part of the limbic system (emotions)
- The pituitary gland is attached to the hypothalamus
- lies on the lateral wall and floor of third ventricle



- Important autonomic nervous system center
  - Helps regulate body temperature
  - Controls water balance
  - Regulates metabolism

## Epithalamus

- Forms the posterior wall of the third ventricle
- small region superior and posterior to the thalamus.
- Consist of
  - 1) Pineal gland
    - Size of a small pea
    - Protrudes from the posterior midline of the third ventricle
    - Secretes the hormone **melatonin**. more melatonin is liberated during darkness than in light, this hormone is thought to promote sleepiness (biological clock) .
  - 2) Habenular nuclei:
    - involved in olfaction, especially emotional responses to odors



(a) Posterior view of midbrain in relation to brain stem