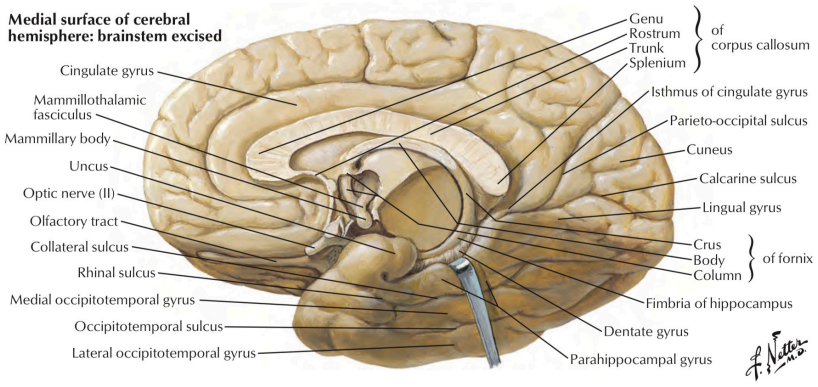


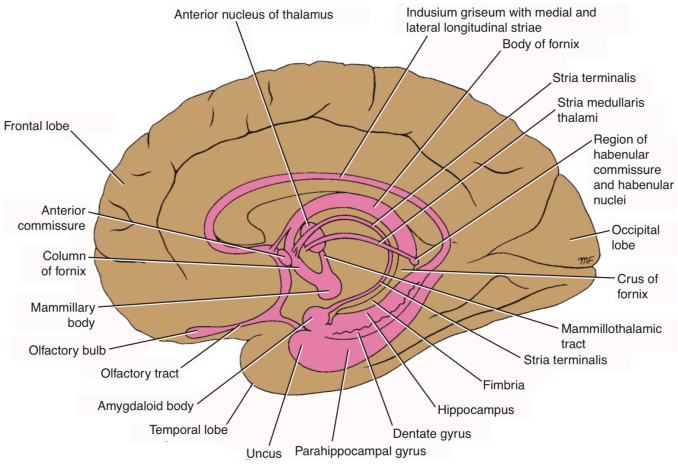


Figure 9-3 Medial aspect of the right cerebral hemisphere showing structures that form the limbic system.

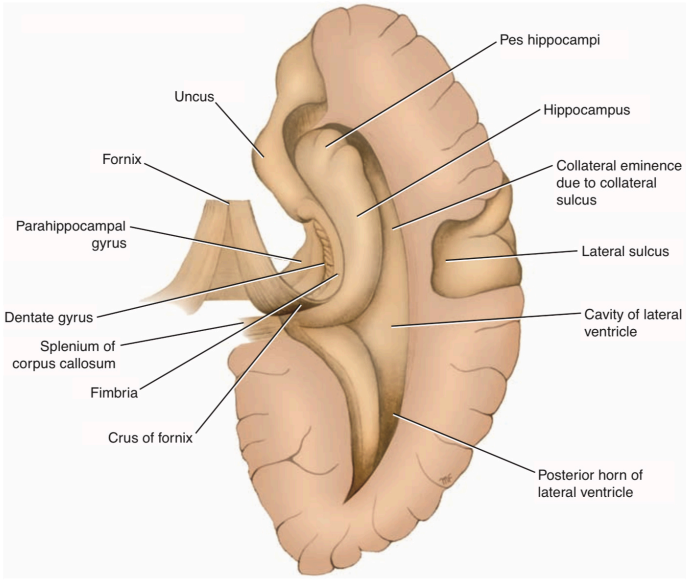
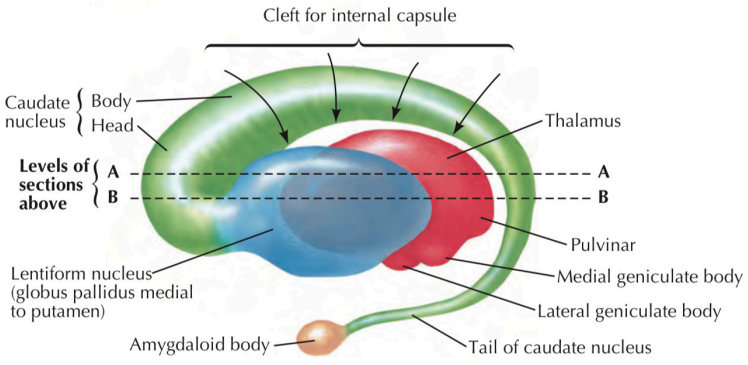
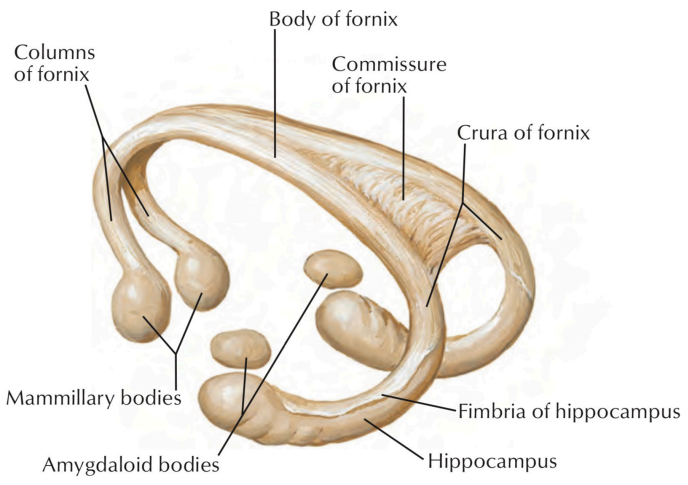


Figure 9-4 Dissection of the right cerebral hemisphere exposing the cavity of the lateral ventricle, showing the hippocampus, the dentate gyrus, and the fornix.



Interrelationship of thalamus, lentiform nucleus, caudate nucleus, and amygdaloid body (schema): left lateral view



Fornix: schema

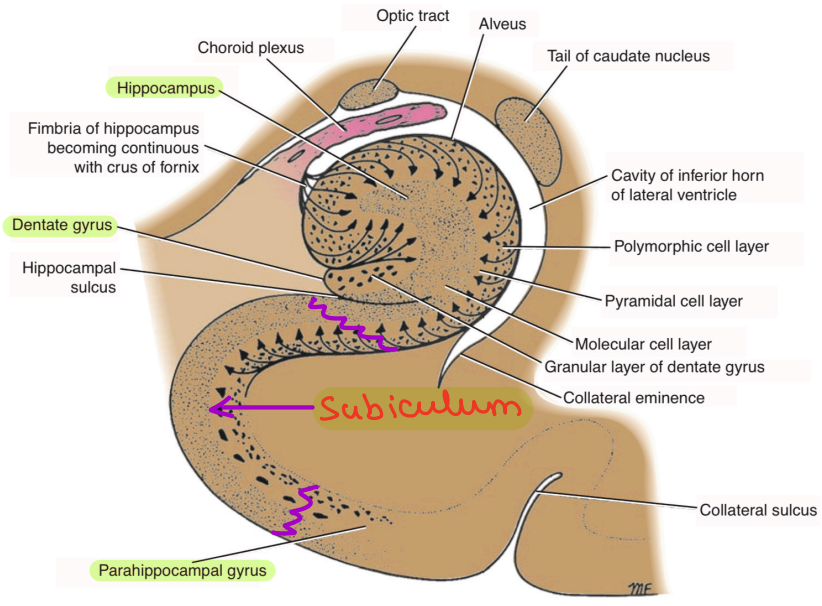
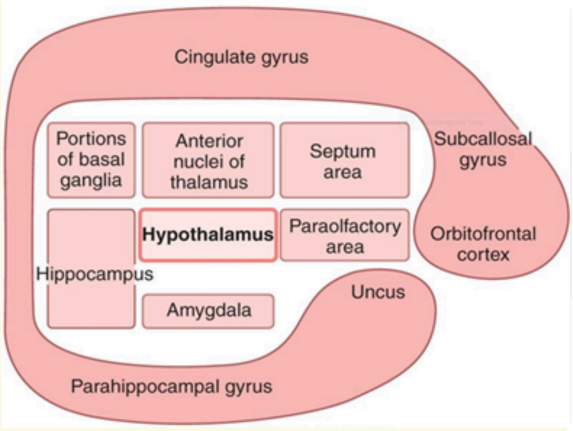


Figure 9-5 Coronal section of the hippocampus and related structures.

*] Limbic system / Viscaral Brain :-

Location :- Crown on the Brainstem / Junction of Diencephalon & Telencephalon



Functions :- L :- Learning
I :- Integration
M :- Memory (Recent)
B :- Behaivour
I :- Inhibition of Aggressive Behaivour
C :- Control over Emotions

Components
- a) Cortical :- i) Limbic lobe
  - Cingulate gyrus
  - uncus
  - Parahippocampal gyrus
- ii) Hippocampal formation :- Hippocampus & its connectio
- b) Subcortical :- i) A :- Amygdala
  - ii) S :- Septal nuclei
  - iii) H :- Hypothalamus & Mamillary body
  - iv) O :- Olfactory area of Forebrain
  - v) T :- Thalamus (Ant. Nucleus)

A] Amygdala [Almond shaped gray matter]

*] Amygdala is aka Window to the Limbic system coz it is thro--ugh amygdala that limbic sys. sees the place of the person in the world

i] Afferent fibres come from Olfactory Bulb via Olfactory Tract

ii] Efferent fibres go to
- Supracommissural fibres :- Septal nuclei
- Commissural fibres :- Ant. commissure thereby communi--cating c̄ opp. side amygdala
- Infracommissural fibres :- Hypothalamus

} STRIA TERMINALIS

- Taking U turn :- Habenular nucleus } STRIA MEDULLARIS THALAMI

iii) Function :- S :- Sexual drive
E :- Excitability
R :- Rage
F :- Fear

iv) Lesion :- Kluver - Bucy syndrome (B/L)
- Disinhibited behaivour :- i) Hyperorality (excessive chewing, sucking)
  - ii) Hyperphagia
  - iii) Hypersexuality
- Placidity (Loss of Normal fear & anger response)
- Hyperdocility (excessive obidience, loss of ability to resist commands)
- Visual agnosia
- Seizures

B] Hippocampus (Ammons Horn) :-

Components :- i) Cornoammonis
ii) Dentate gyrus
iii) Subiculum

Anatomy :- i) Uncus → Parahippocampal gyrus → Isthmus → Cingulate gyrus
ii) Hippocampus extends from the floor of Inf. Horn of Lateral Ventricle ie. from Uncus to Corpus Call.
iii) White matter covering of Hippocampus ⇒ ALVIUS
iv) White matter covering of Dentate gyrus (tooth like lateral to Hippocampus) ⇒ FIMBRIAE
v) Peshippocampus is paw like extension of Hippocampus anteriorly
vi) Cornoammonis (Hippocampus proper) has 3 layers :- Outer & Inner Polymorphic cells & Inner Pyramidal cell layer
vii) Dentate gyrus continues as Gyrus faciolaris (at splenium) → Indusium griesium (over Corpus Call.)

Connections :- i) Aff. fibres come from Area 28 (Entorrhinal Cortex)
ii) Eff. fibres go to
- → Opposite hippocampus via Fornix Commissure
- → Septal nuclei & Ant. Hypothalamus
- → Mamillary body into the Cingulate gyrus

Functions :- i) Endocrine & visceral function in response to Emotion (Seat of Soul)
ii) Recent Memory
iii) Psychomotor epilepsy (Complex partial seizures c̄ Intact awareness)
iv) Amnesia in Alzheimers
v) Vascular dementia [Hippocampus is supplied by PCA & Ant. choroidal art ⇒ Their block → Dementia)

C] White Matter of Limbic System :-
a) Striae terminalis & striae medullary thalami
b) Medial forebrain bundle [One of the Reward Centre of Brain)
c) Diagonal band of Broca
d) Ant. commissure
e) Fornix
f) Mamillothalamic tract
g) Cingulum

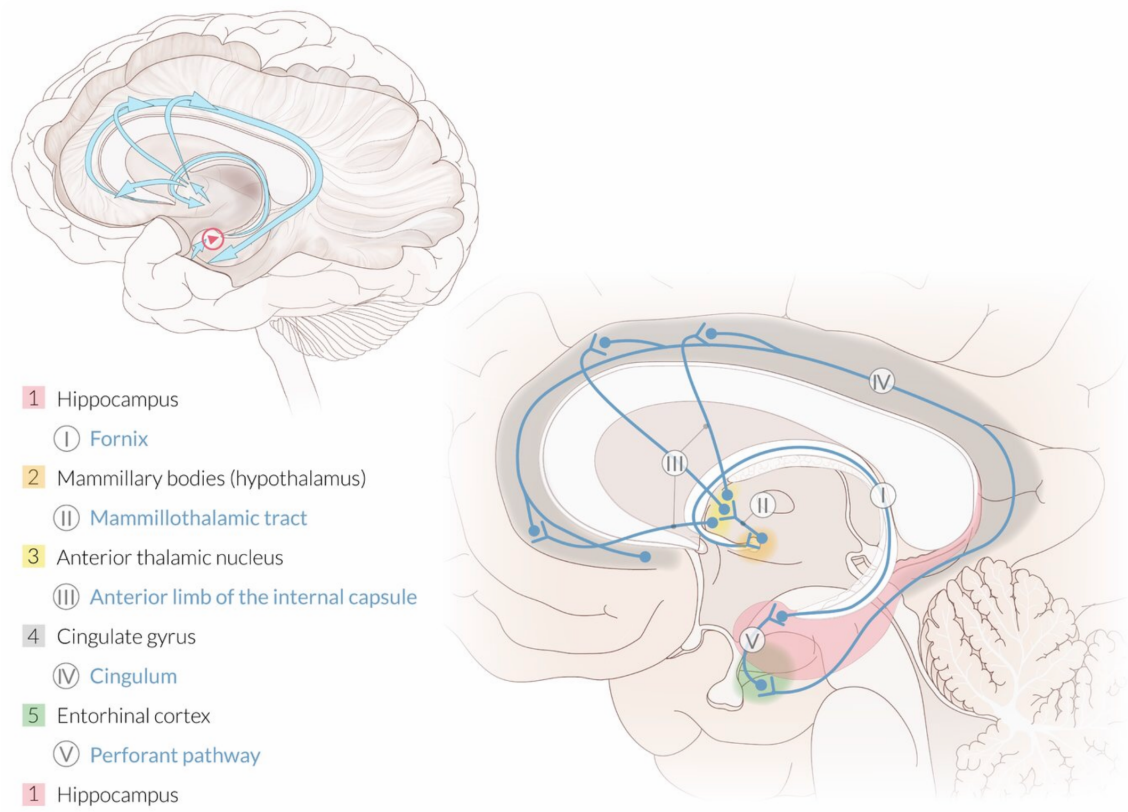
*] FORNIX :-

Anatomy :- i) Forms lower boundary of Septum Pelucidum
ii) From Hippocampus to Mamillary body
iii) All 3 types of white matter :- a) Commisural :- Commisure of Fornix
b) Association :- Dorsal fornix (go to Cingulate gyrus)
c) Projection :- Mamillothalamic tract
[Association > Commisural > Projection]
iv) ALVIUS + FIMBRAE + CRUS of fornix + BODY of fornix + COLUMNS of fornix = FORNIX
(Hippocam.) (Dent. gyrus)

Connections :- i) Afferent fibres come from Pyramidal cells of Hippocampus going to Mamillary Body
ii) Some fibres go in front of Ant. commisure (Pre-comm. fibres), some Post & some in the Ant. comm.
iii) From Mamillary body they go to Ant. Nucleus of Thalamus via Mamillothalamic tract or Vicqd Azyr bundle
iv) From thalamus to Cingulate gyrus

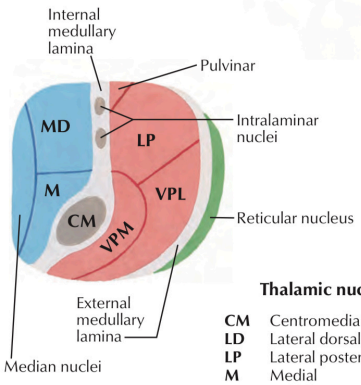
↓

PAPEZ CIRCUIT



Lesion :- Anterograde Amnesia [Acute Amnestic Syndrome]

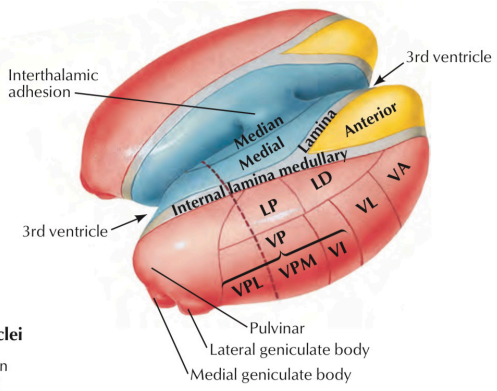
*] THALAMUS :-



Schematic section through thalamus
(at level of broken line shown in figure at right)

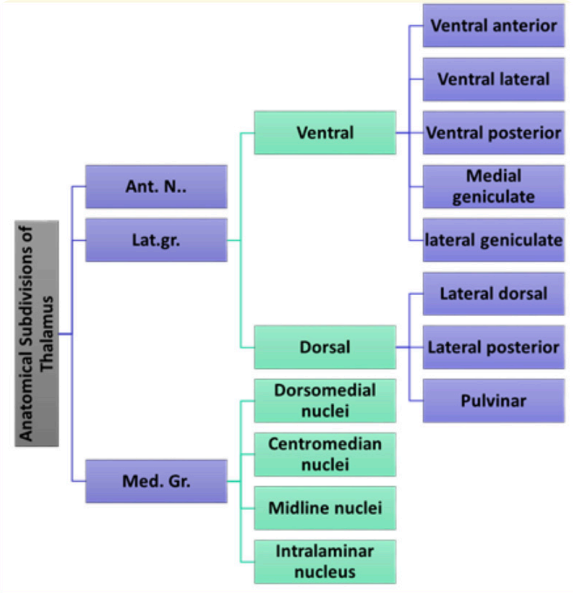
Thalamic nuclei

CM	Centromedian
LD	Lateral dorsal
LP	Lateral posterior
M	Medial
MD	Medial dorsal
VA	Ventral anterior
VI	Ventral intermedial
VL	Ventral lateral
VP	Ventral posterior
VPL	Ventral posterolateral
VPM	Ventral posteromedial



Schematic representation of thalamus
(external medullary lamina and reticular nuclei removed)

Lateral nuclei
Medial nuclei
Anterior nuclei



Nuclei	Input	Output	Function
Anterior	Mamillothalamic tract, cingulate gyrus, hypothalamus	Cingulate gyrus, hypothalamus	Regulation of alertness and attention, acquisition of memory
Dorsomedial	Prefrontal cortex, hypothalamus, other thalamic nuclei	Prefrontal cortex, hypothalamus, other thalamic nuclei	Integration of somatic, visceral, and olfactory information and relation to emotional feelings and subjective states
Lateral dorsal, lateral posterior and pulvinar	Cerebral cortex and other thalamic nuclei	Cerebral cortex and other thalamic nuclei	Unknown
Ventral postero lateral	Medial lemniscus spinothlamic pathway	Primary somatosensory area cortex	Relays common sensations to consciousness
Ventral posteromedial	Gustatory Trigeminal	Primary somatosensory area cortex	Relays common sensations to consciousness
Ventral anterior	Reticular formation, substantia nigra, corpus striatum, premotor cortex, other thalamic nuclei	Reticular formation, substantia nigra, corpus striatum, premotor cortex, other thalamic nuclei	Influences activity of motor cortex
Ventral lateral	Cerebellum, reticular formation, substantia nigra, corpus striatum, premotor cortex, other thalamic nuclei	Cerebellum, reticular formation, substantia nigra, corpus striatum, premotor cortex, other thalamic nuclei	Influences activity of motor cortex
Intralaminar	Reticular formation, spinothalamic and trigeminothalamic tracts	To cerebral cortex via other thalamic nuclei and corpus striatum	Influences level of consciousness and alertness
Midline	Reticular formation	Unknown	Unknown
Reticular	Cerebral cortex, reticular formation	Other thalamic nuclei	Cerebral cortex regulating thalamus
Medial geniculate body	Inferior colliculus, lateral lemniscus from the predominantly opposite ear	Auditory radiation to superior temporal gyrus	Hearing
Lateral geniculate body	Optic tract	Optic radiation to the visual cortex of occipital lobe	Visual information from the opposite field of vision

*) Thalamus
- → Sensory Gateway to the Cerebral Cortex
- → largest part of Diencephalon
- → Divided into 3 nuclei by 'Y' shaped bundle