Anatomy of Basal Ganglia & internal Capsule

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By

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Intended Learning Outcomes (ILOs)

1. Describe anatomy of the basal ganglia.

2. Describe anatomy of the internal capsule.

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Agenda

1. Anatomy of the basal ganglia.

2. Anatomy of the internal capsule.

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Anatomy of Basal Ganglia

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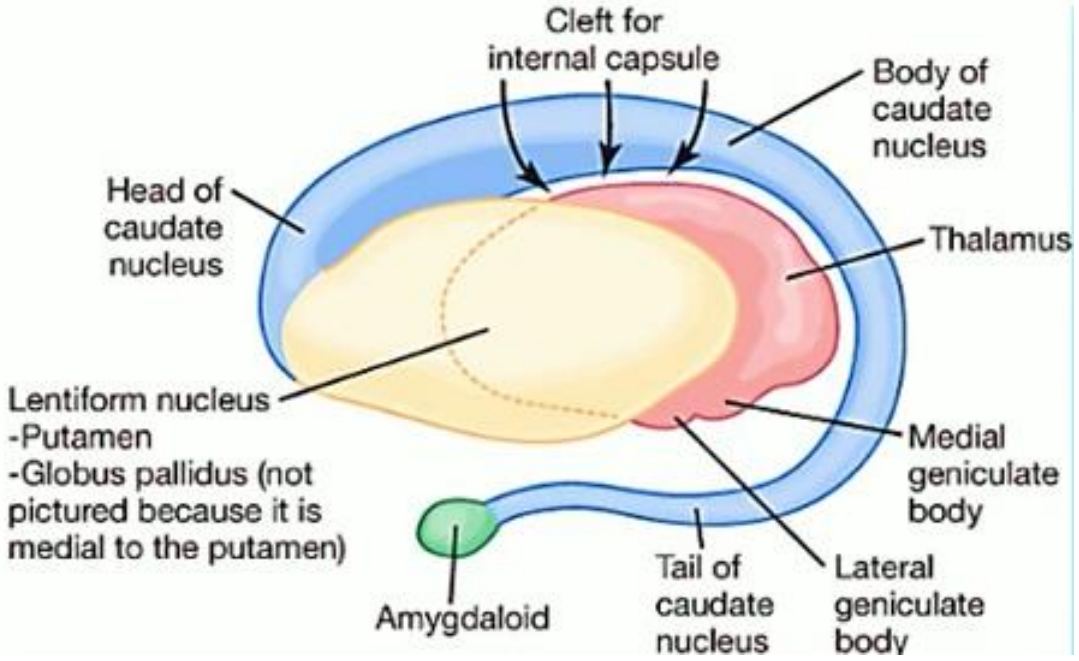
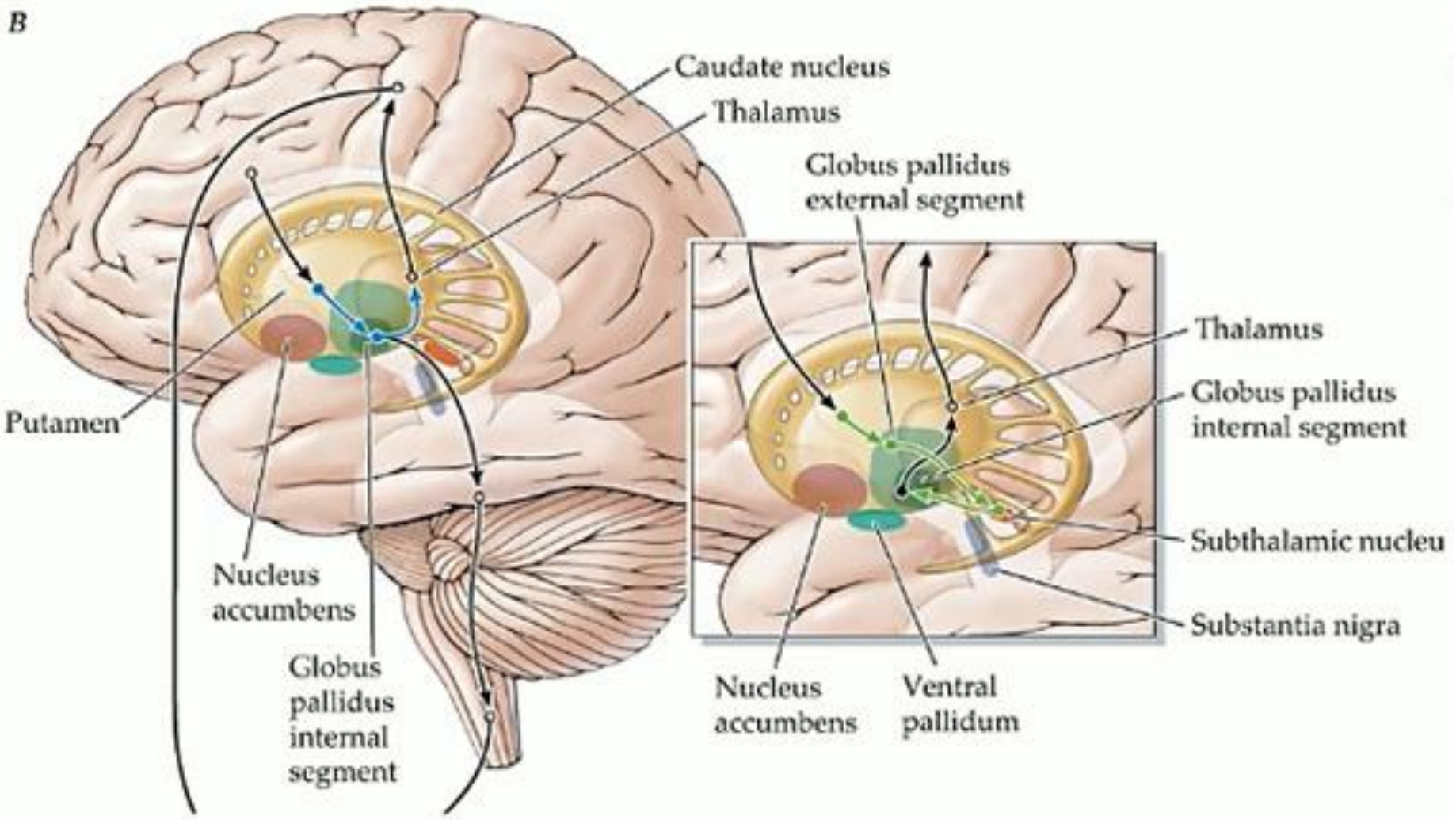
Basal Ganglia

Masses of grey matter deep to the floor of the lateral ventricle & are involved in motor control and cognition

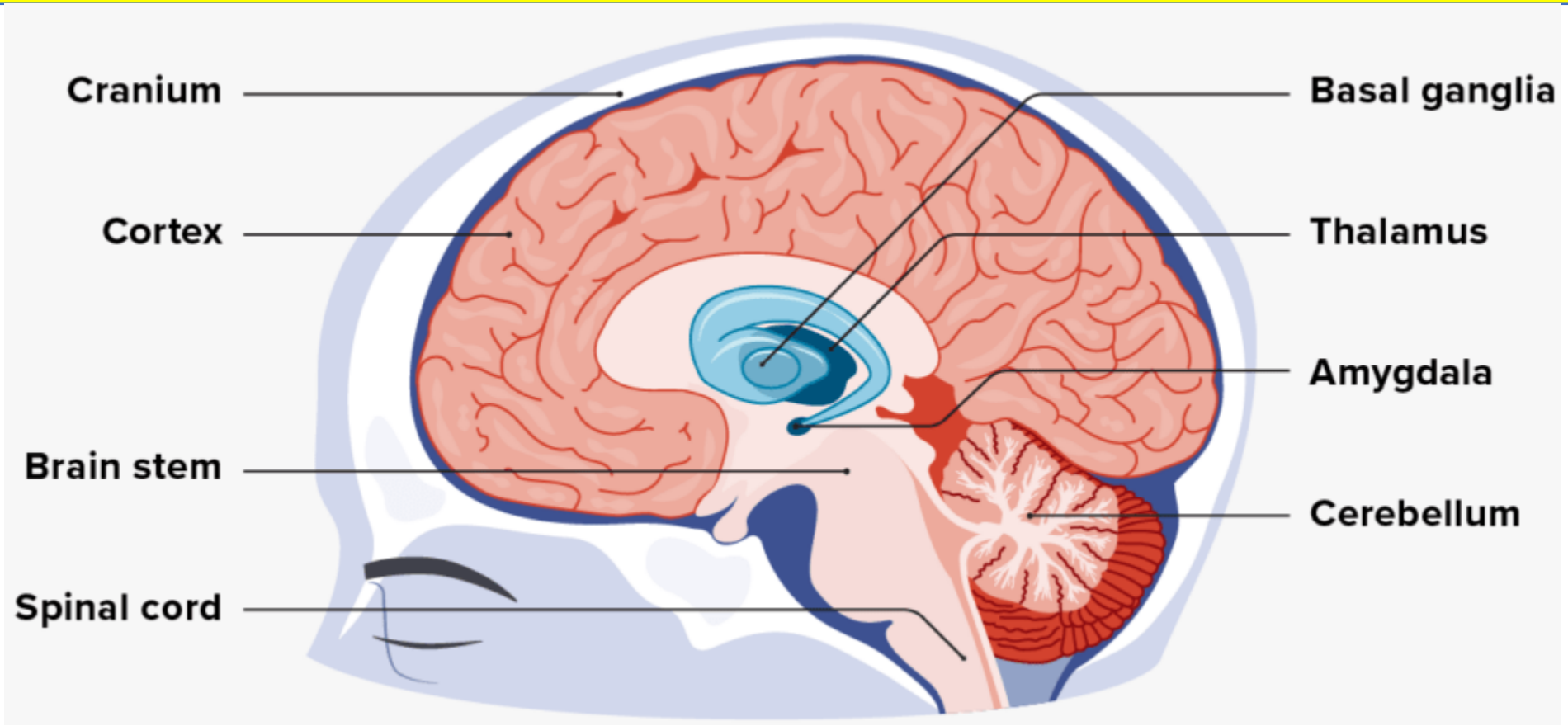
Components: they are composed of: A.

1. **Corpus Striatum: formed of:**
   a. **Caudate nucleus.**
   b. **Lentiform nucleus.**
2. **Amygdaloid nucleus: functionally, it is a part of the limbic system.**
3. **Claustrum: controversial function.**




B
Caudate nucleus
Thalamus
Globus pallidus external segment
Putamen
Nucleus accumbens
Globus pallidus internal segment
Thalamus
Globus pallidus internal segment
Subthalamic nucleu
Substantia nigra
Nucleus accumbens
Ventral pallidum

Components of Basal Ganglia



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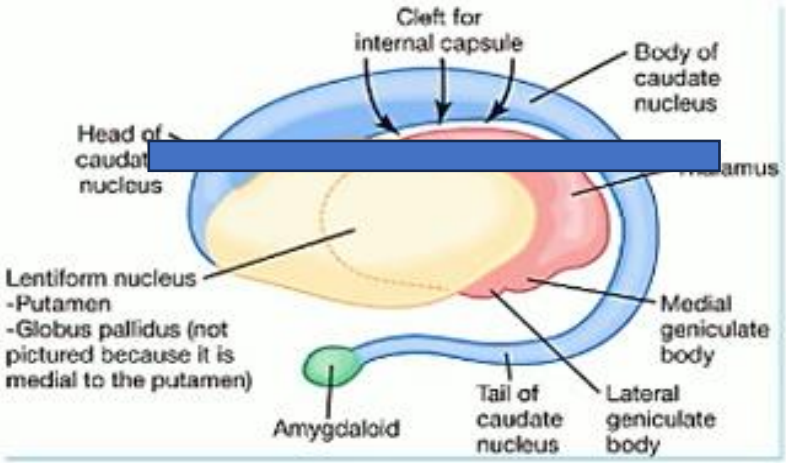
BASAL GANGLIA

Corpus striatum



Other nuclei

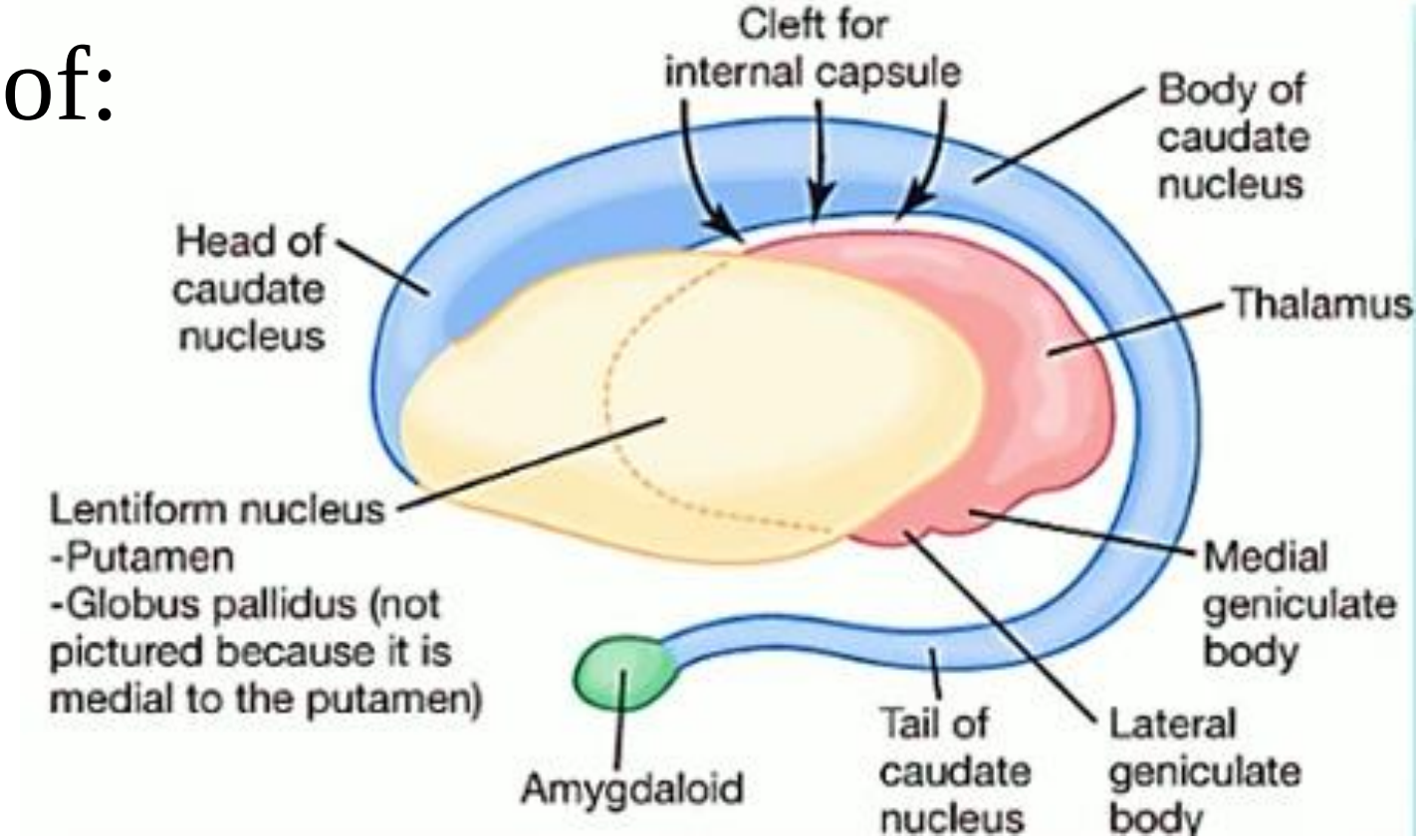
- **Amygdaloid nuclei:** they are part of the limbic system.
- **Claustrum:** a band of grey matter that lies lateral to lentiform nucleus, and separated from it by the external capsule. It is separated from grey matter of the insula by the extreme capsule.

1. Corpus Striatum

Corpus Striatum: formed of:

A. Caudate nucleus.

B. Lentiform nucleus.



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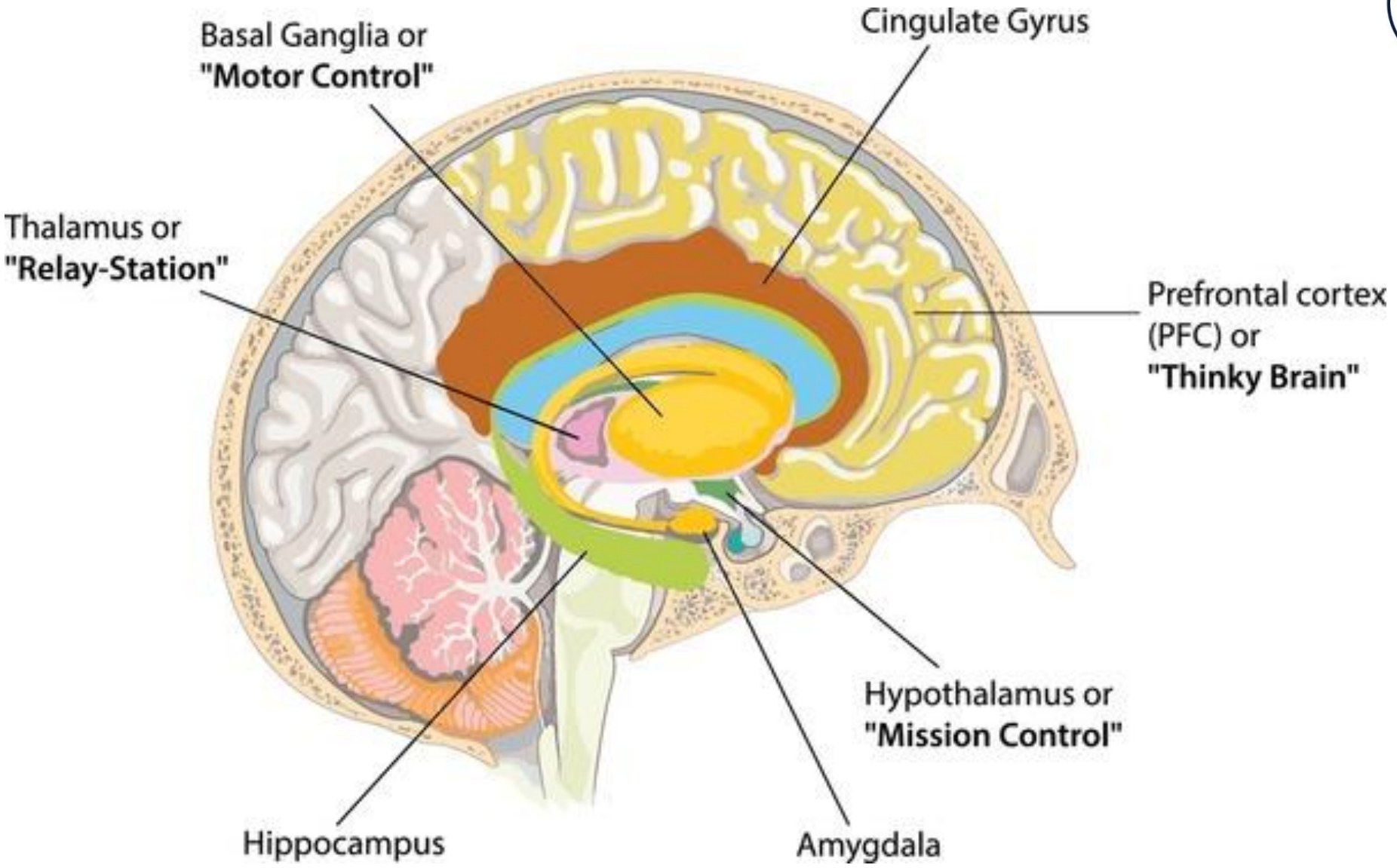
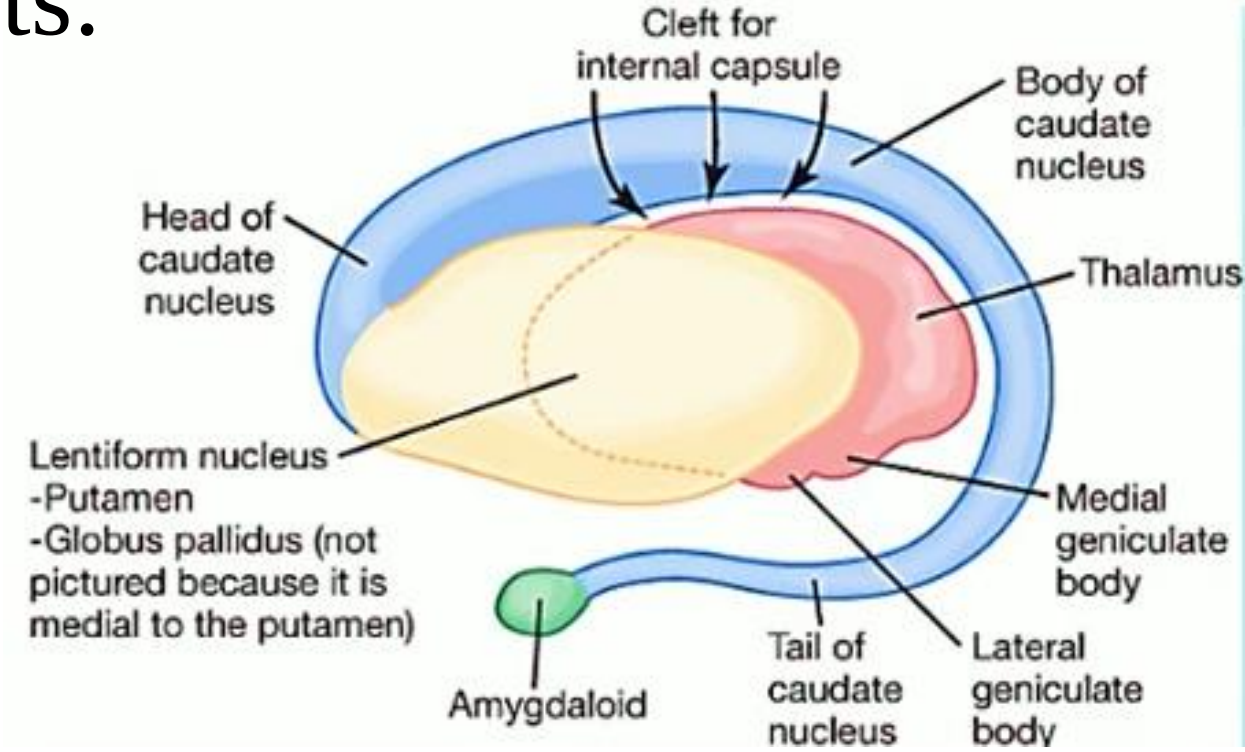

Basal Ganglia or
"Motor Control"
Cingulate Gyrus
Thalamus or
"Relay-Station"
Prefrontal cortex
(PFC) or
"Thinky Brain"
Hypothalamus or
"Mission Control"
Hippocampus
Amygdala

A. Caudate nucleus

Shape: is a C-shaped nucleus.

Parts: it is formed of 3 parts:

1. Head
2. Body
3. Tail.



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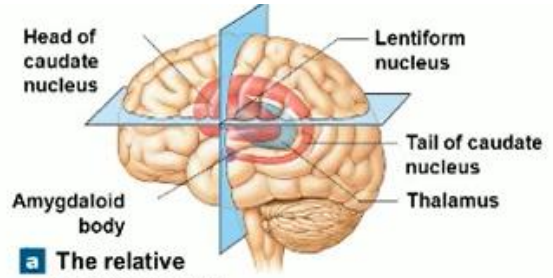
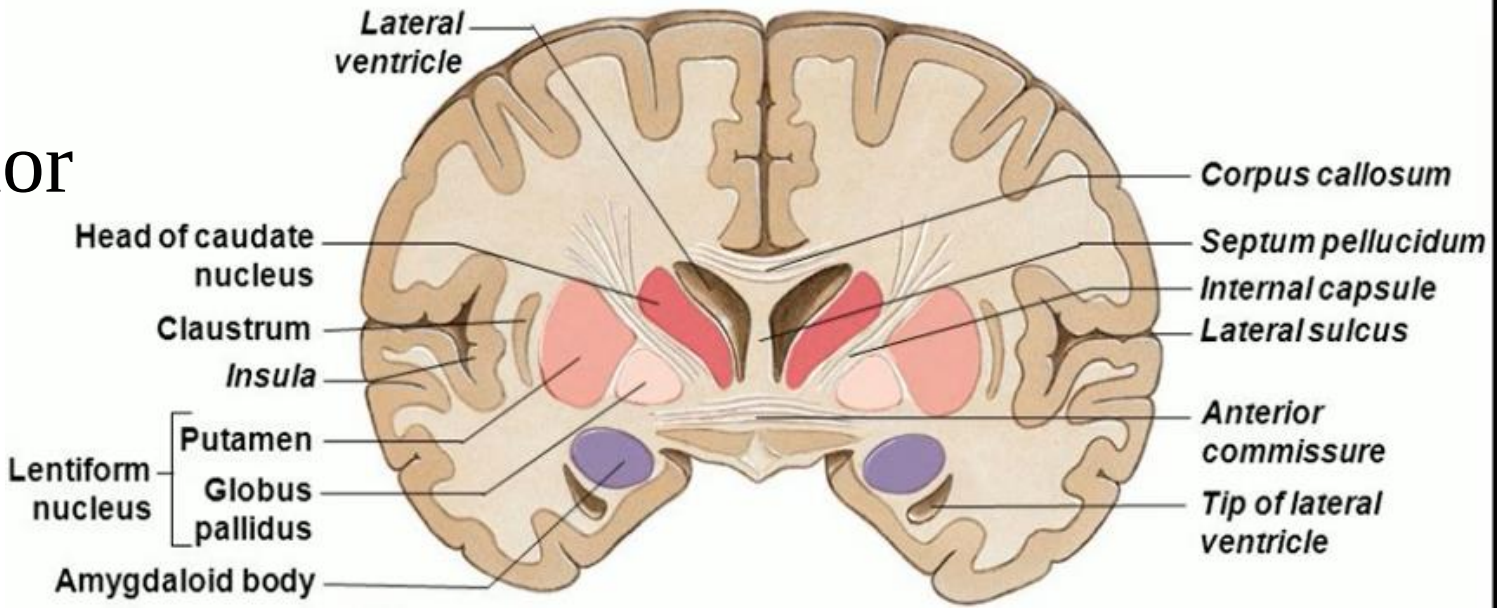
1. Head of caudate nucleus

- It forms the lateral wall of the **anterior horn** of the lateral ventricle

- It is separated from the lentiform nucleus by the anterior limb of the **internal capsule**.



Coronal section



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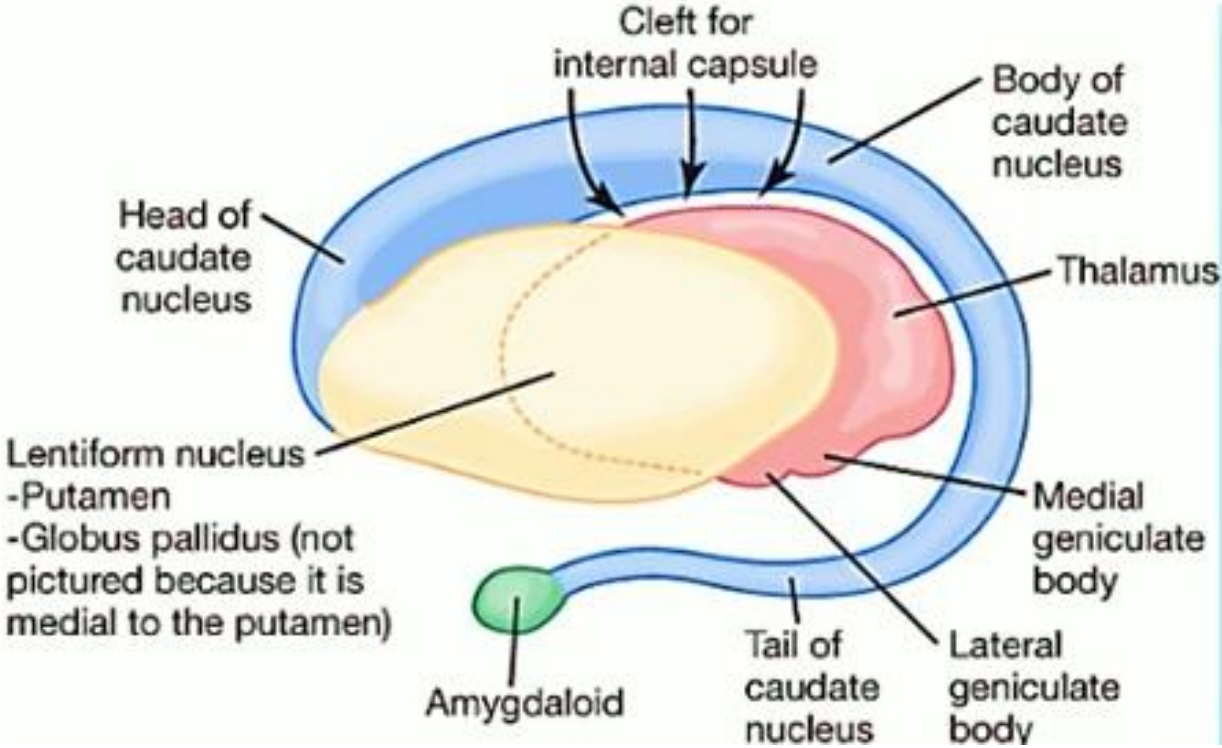
2. Body of caudate nucleus

- It lies in the floor of the **body** part of the **lateral ventricle**
- It is separated from the thalamus by the thalamo-striate vein and the stria terminalis (fibers connecting the amygdaloid nucleus with the hypothalamus and septal area).



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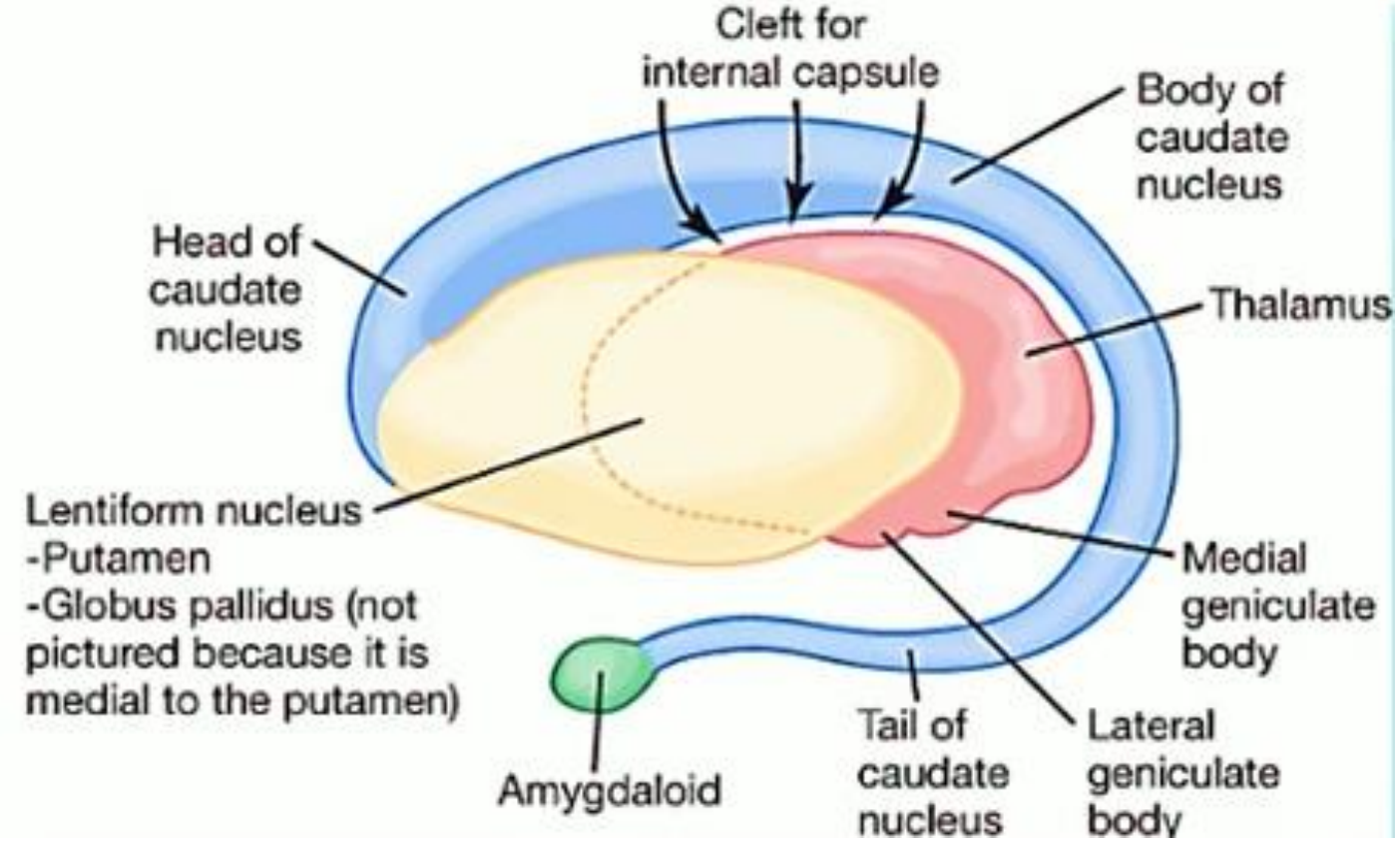
3. Tail of caudate nucleus

- Extends into the temporal lobe in the roof of the **inferior horn of the lateral ventricle**.
- Ends anteriorly at the **amygdaloid** nucleus.



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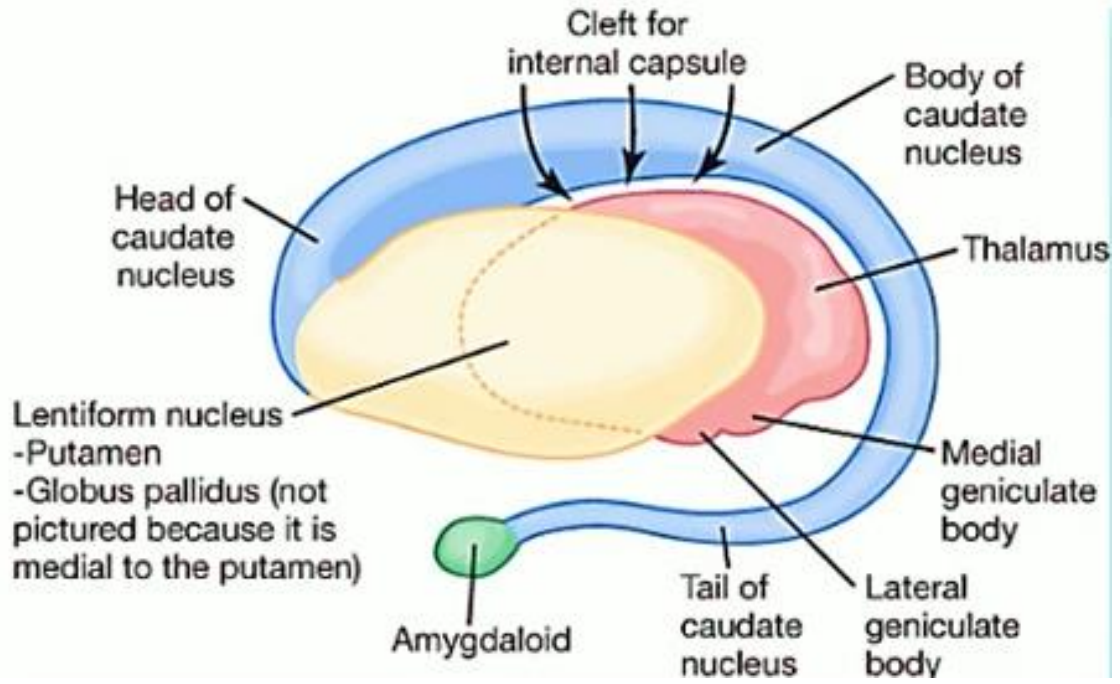
B. Lentiform nucleus

Shape: wedge-shaped. Its apex is directed medially.

Parts: It is divided into two parts:

1. **Putamen:** is the lateral part.
2. **Globus pallidus:** is the medial part.



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Relation of lentiform nucleus

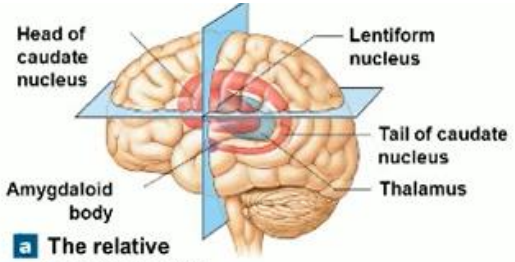
Medially: related to the internal capsule.

- Anterior limb separates it from caudate nucleus.
- Posterior limb separates it from the thalamus.

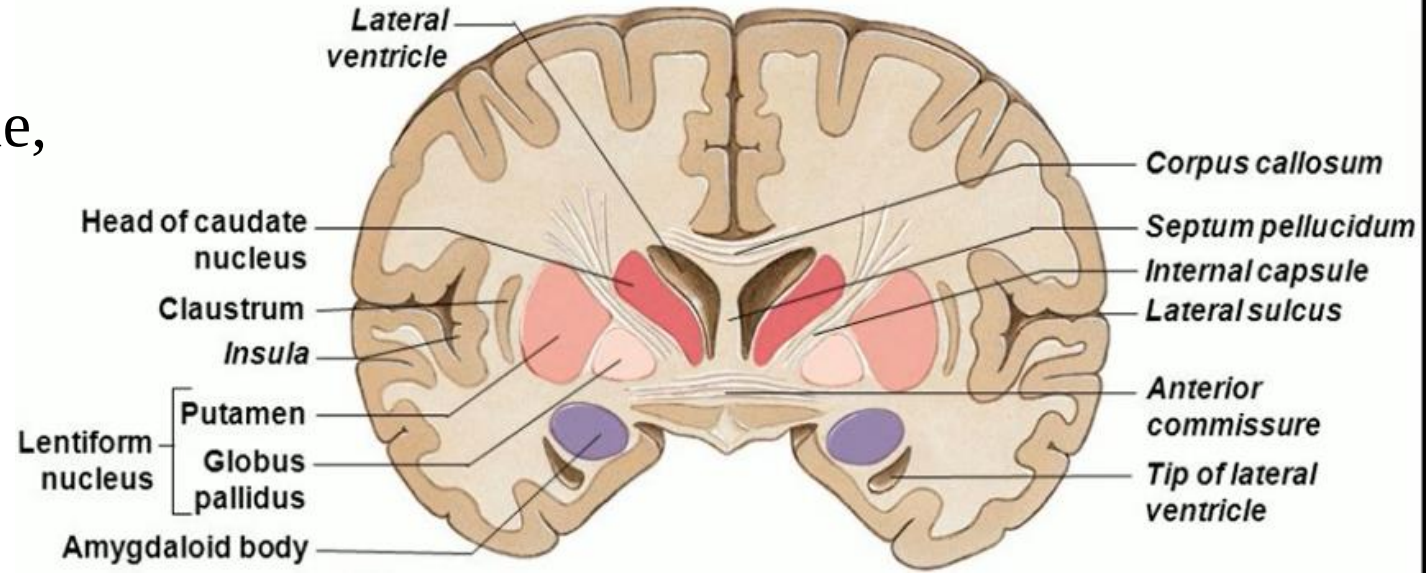
Laterally: related to the external capsule, which separates it from the claustrum.

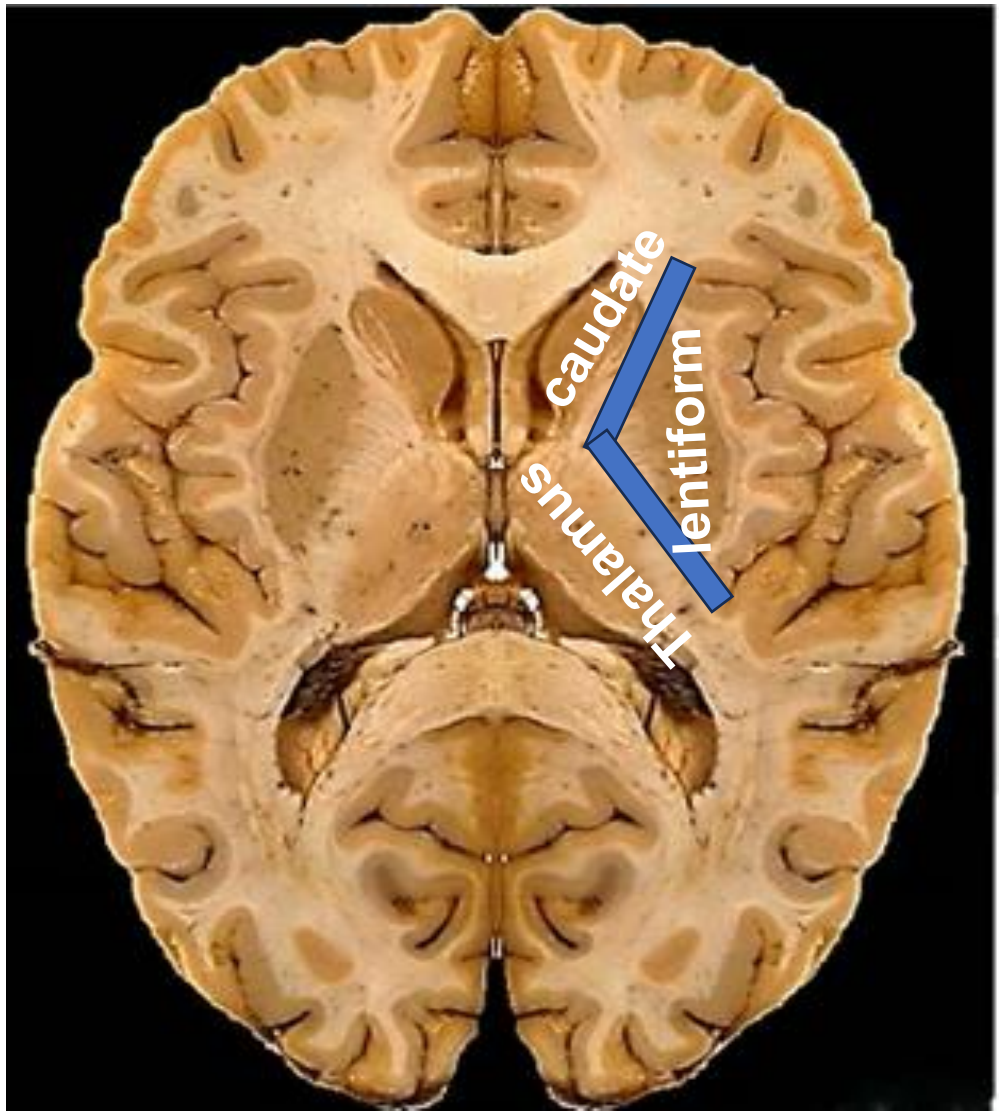
Inferiorly: related to the amygdaloid nucleus and the anterior commissure.

Coronal section



a The relative positions of the basal nuclei in the intact brain, lateral view





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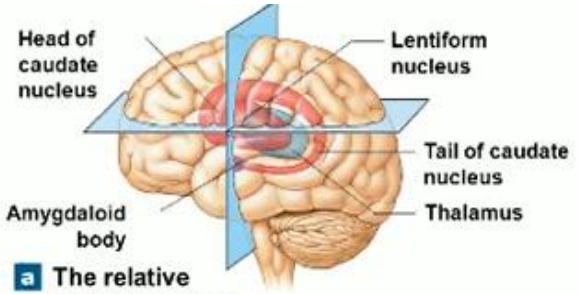
Claustrum

Relation: deep to the insula
External capsule: separating it from the lentiform nucleus.
Extreme capsule: separating it from the insula.

Function: controversial function

Coronal section



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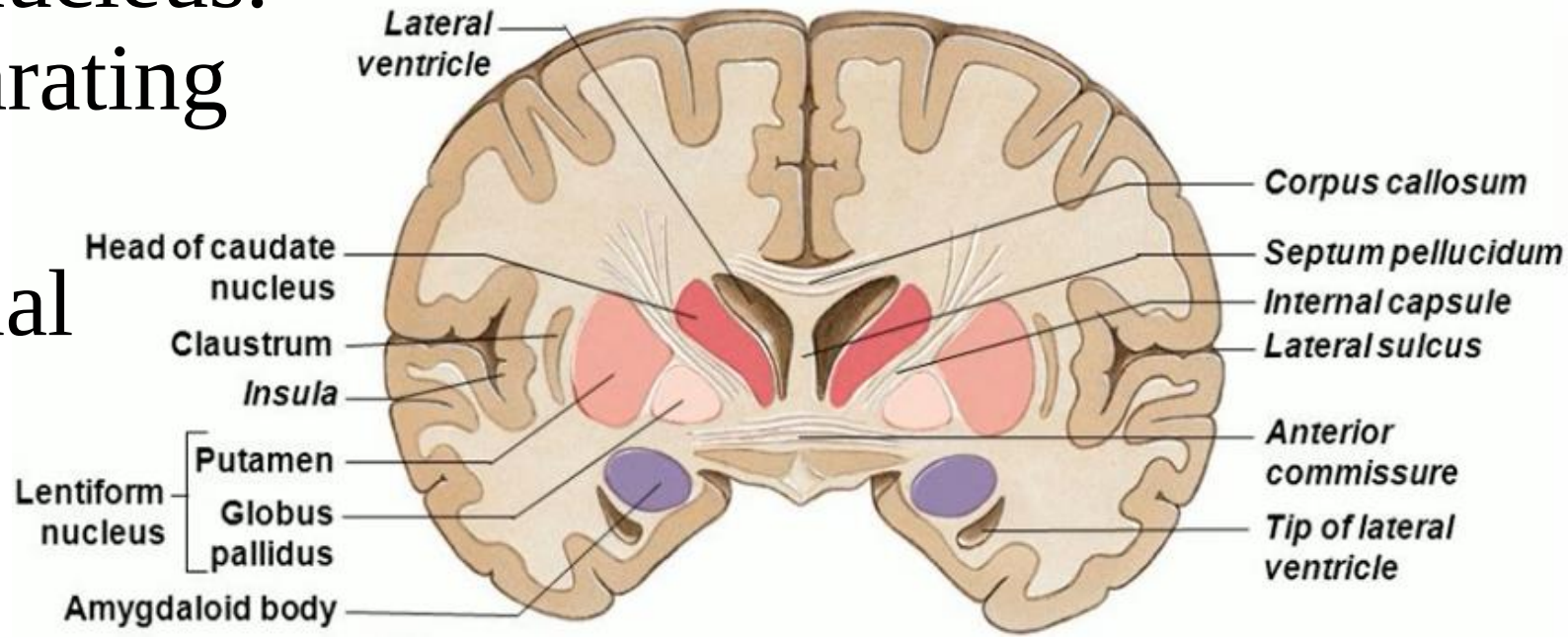

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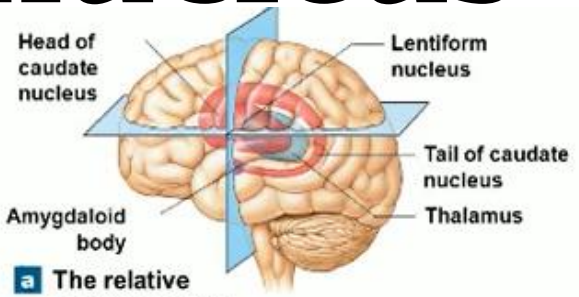
Amygdaloid nucleus

- It lies in the anterior part of the temporal lobe in the roof and in front of the tip of the inferior horn of the lateral ventricle.
- **Function:** It is a part of the limbic and olfactory systems.

Coronal section



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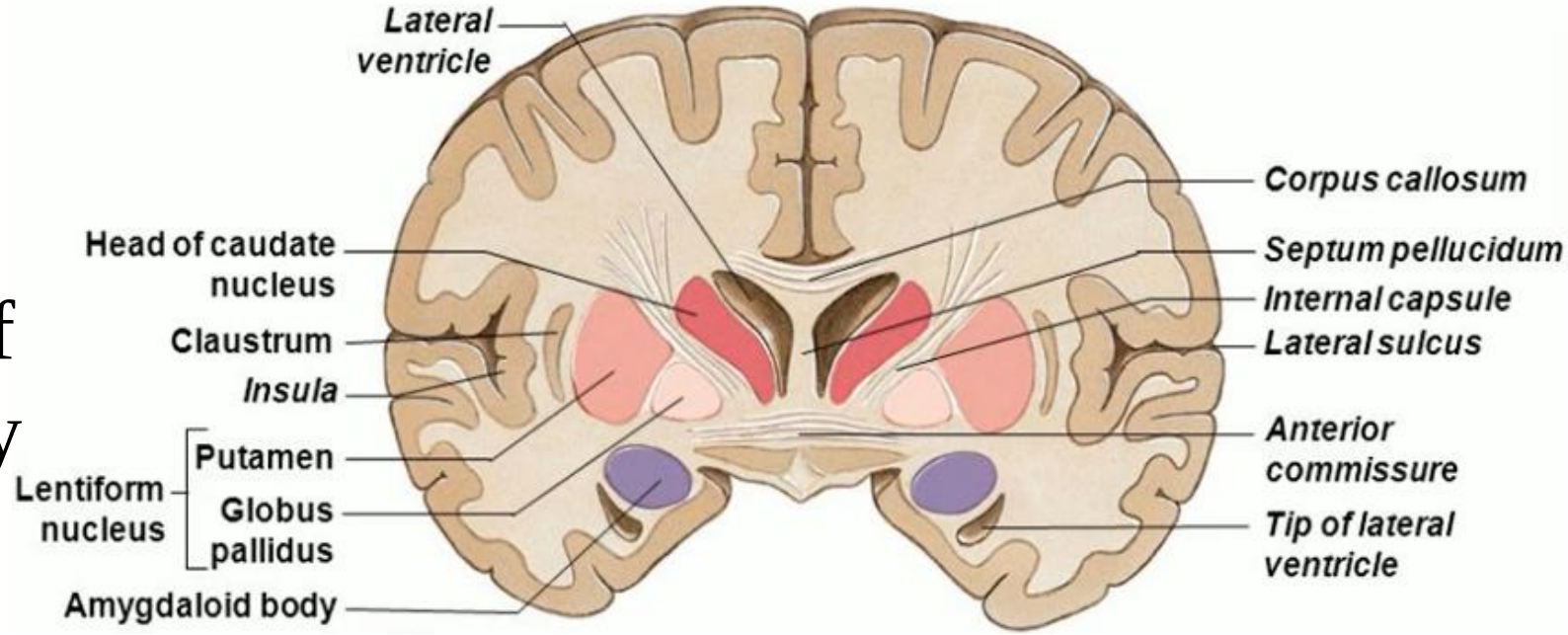

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Blood Supply of basal ganglia

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Arterial supply of the Basal Ganglia

- **Basal ganglia are supplied by internal carotid artery (ICA)**

1. Anterior part of corpus striatum: by the anterior cerebral artery (medial striate artery) from the ICA.

2. Remaining parts of corpus striatum except tail of the caudate nucleus:

- by the middle cerebral artery (lateral striate arteries) from the ICA.

3. Tail of the caudate nucleus & amygdaloid nucleus: anterior choroidal artery from the ICA

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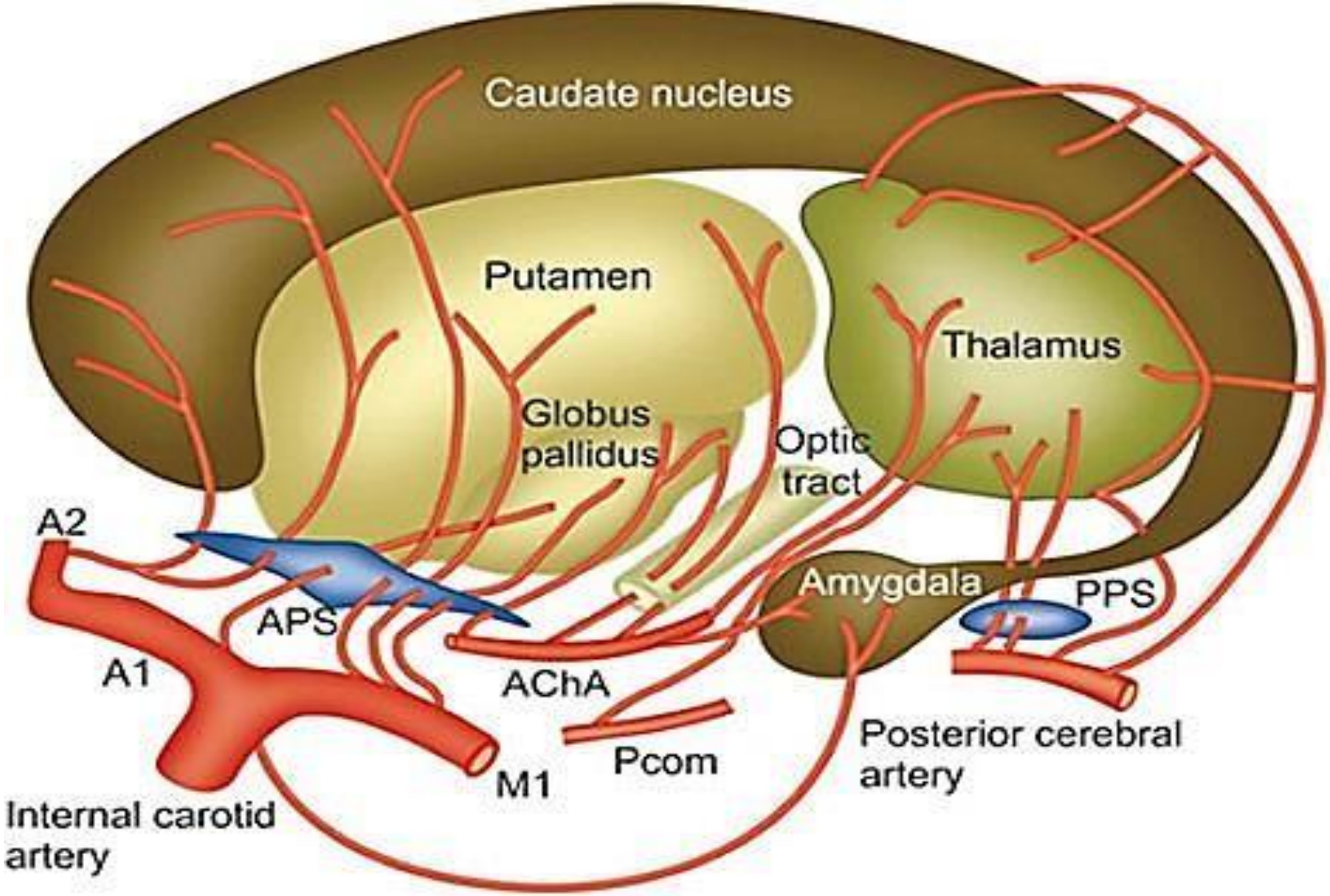
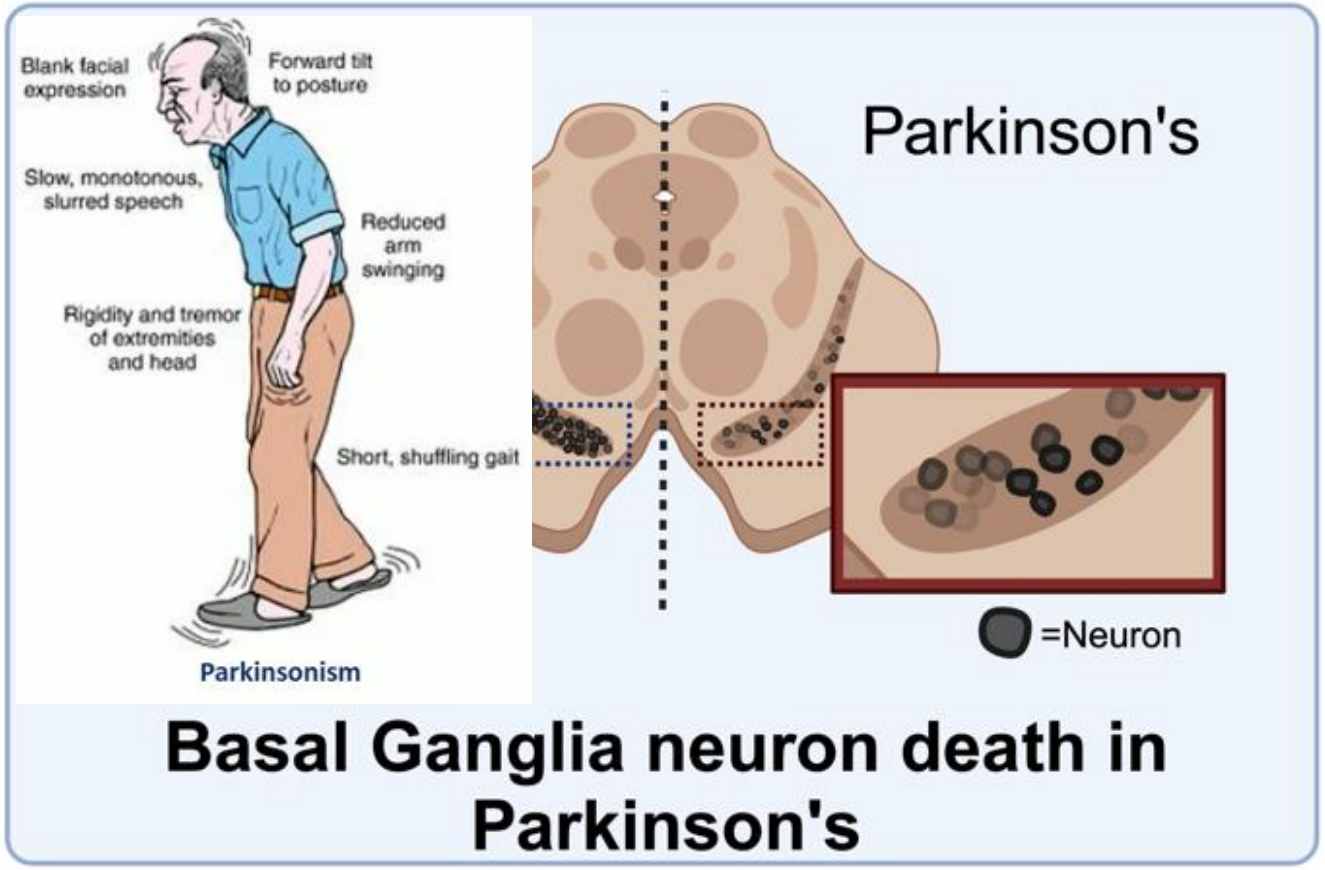

Caudate nucleus
Putamen
Thalamus
Globus pallidus
Optic tract
A2
APS
Amygdala
PPS
A1
AChA
Pcom
Posterior cerebral artery
M1
Internal carotid artery

Malfunction of Basal Ganglia

- Damage to the basal ganglia cells may cause problems controlling speech, movement, and posture. This combination of symptoms is called **parkinsonism**. A person with basal ganglia dysfunction may have trouble starting, stopping, or sustaining movement



Quiz

1. Corpus striatum is supplied by

a. Vertebral
b. Basilar
c. Internal carotid
d. External carotid
e. Subclavian

Answer: c

Anatomy of Internal Capsule

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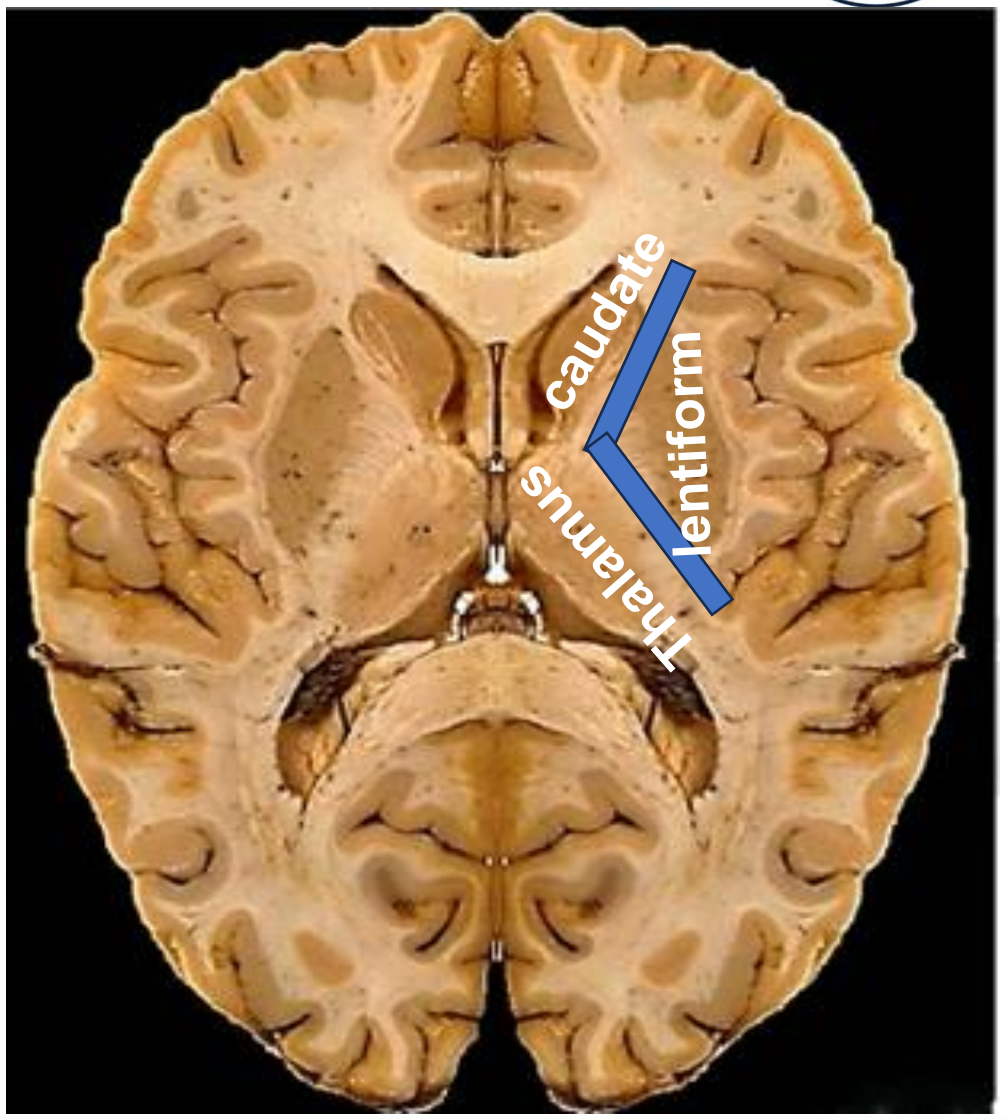
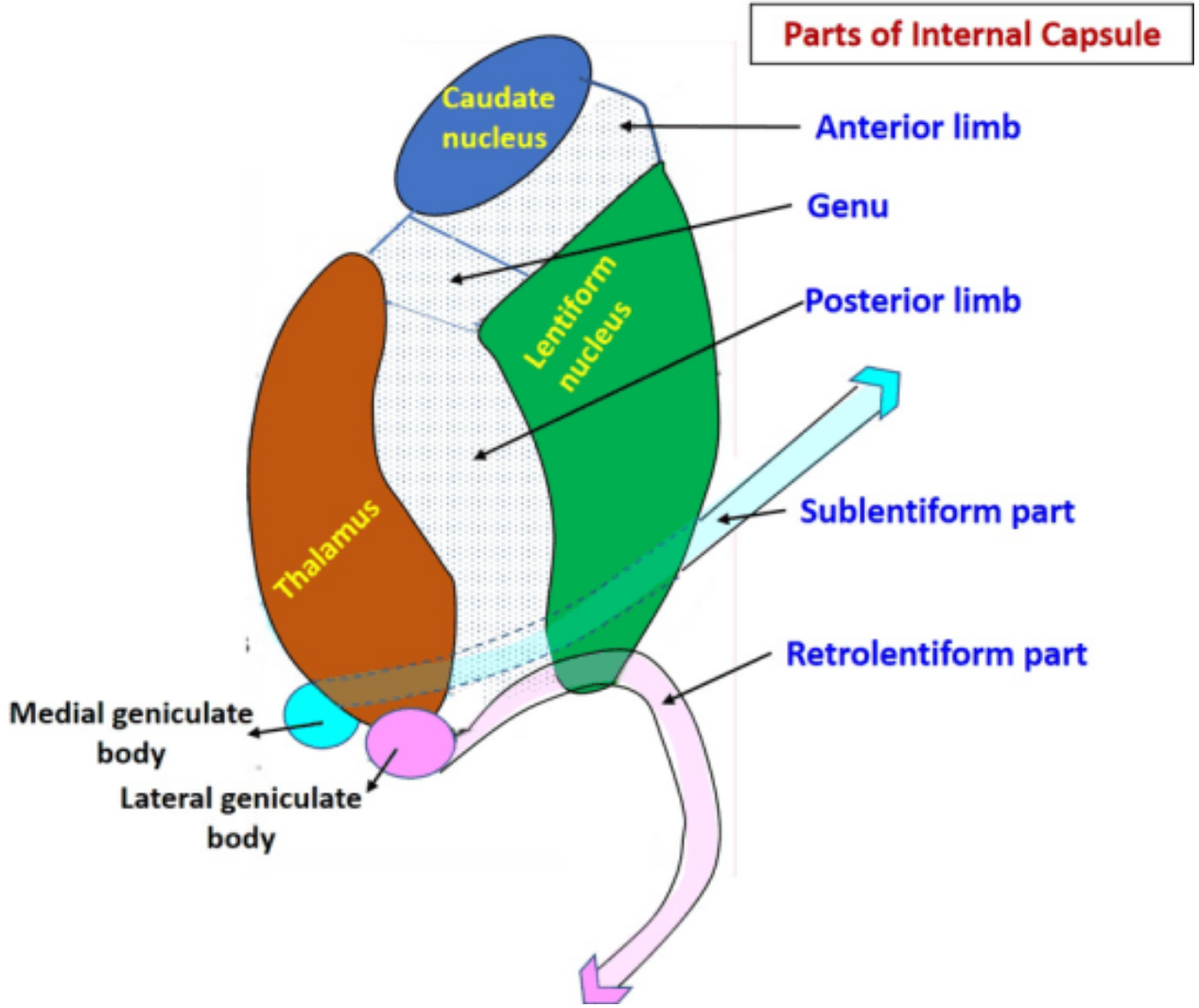
Definition: It is a band of **projection** fibers

Divisions: It is divided into 3 parts:

- **Anterior limb:** between the **lentiform** nucleus and the head of the **caudate** nucleus.
- **Genu:** opposite the apex of the lentiform nucleus.
- **Posterior limb:** between the **lentiform** nucleus and the **thalamus**



- **Posterior limb: is divided into:**
  - A. **Lenticulothalamic part:** between the lentiform nucleus and the thalamus.
  - B. **Retolenticular part:** behind the lentiform nucleus.
  - C. **Sublenticular part:** below the lentiform nucleus.



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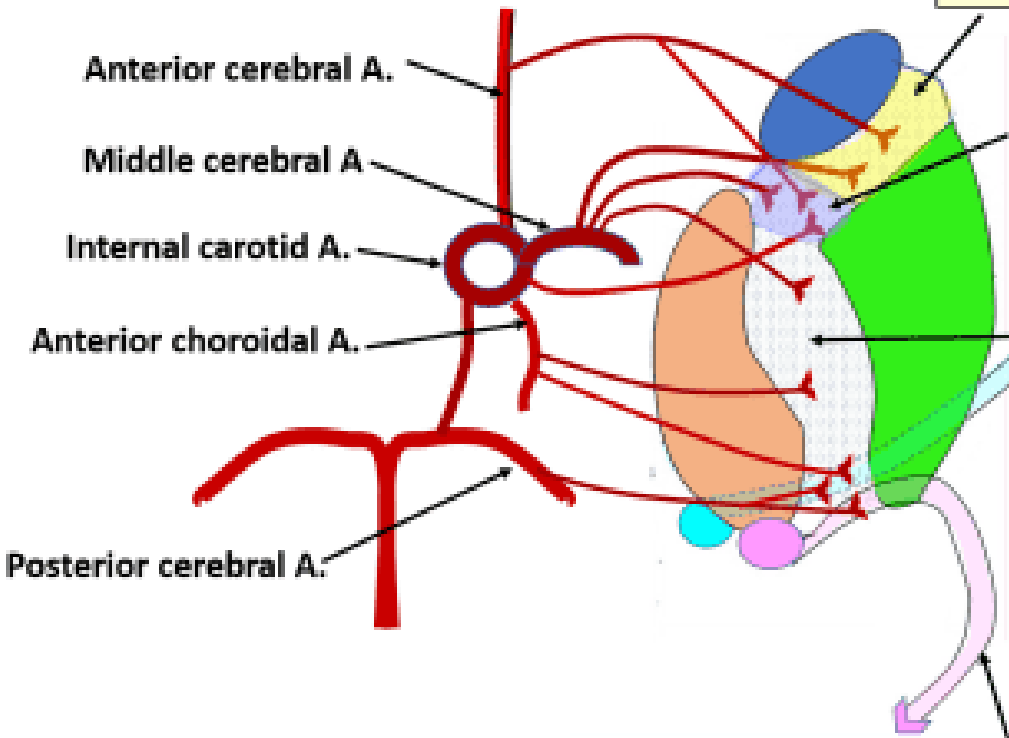
Arterial supply of the internal capsule



Anterior limb
Striate branches of **Anterior cerebral** (including the longest branch - **recurrent artery of Heubner and Middle cerebral**

Genu
Striate branches of **Anterior cerebral, Middle cerebral** and direct branches from **Internal carotid**

Posterior limb
Striate branches from **Middle cerebral** (including large **Charcot artery of cerebral haemorrhage) and Anterior Choroidal.**

Sublentiform Part
Striate Branches from **Posterior cerebral and anterior choroidal**

Retrolentiform Part
Striate Branches from **Posterior cerebral**

Quiz

1. Anterior limb of internal capsule lies between the lentiform nucleus and…

a. Head of the caudate nucleus.

b. Body of the caudate nucleus.

c. Tail of the caudate nucleus.

d. Thalamus

e. Claustrum

Answer: a

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Quiz

1. Is the main arterial supply of internal capsule

a. Vertebral
b. Basilar
c. Internal carotid
d. External carotid
e. Subclavian

Answer: c

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References for further readings

- Oxford Handbook of Clinical Medicine (3rd edition).
- Gray’s anatomy for students
- The Clinical Practice Of Neurological and Neurosurgical Nursing Fourth Edition.


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