

Internal structure of cerebral hemisphere

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Lateral ventricle

Def:

- **2** one in each hemisphere
- Separated by a thin vertical portion called **septum pellucidum**.
- **C-shaped** structure lined with ependymal cells and filled with CSF.
- each ventricle is divided into:
 - body = central part
 - anterior horn = frontal lobe
 - posterior horn = occipital horn
 - inferior horn = temporal horn

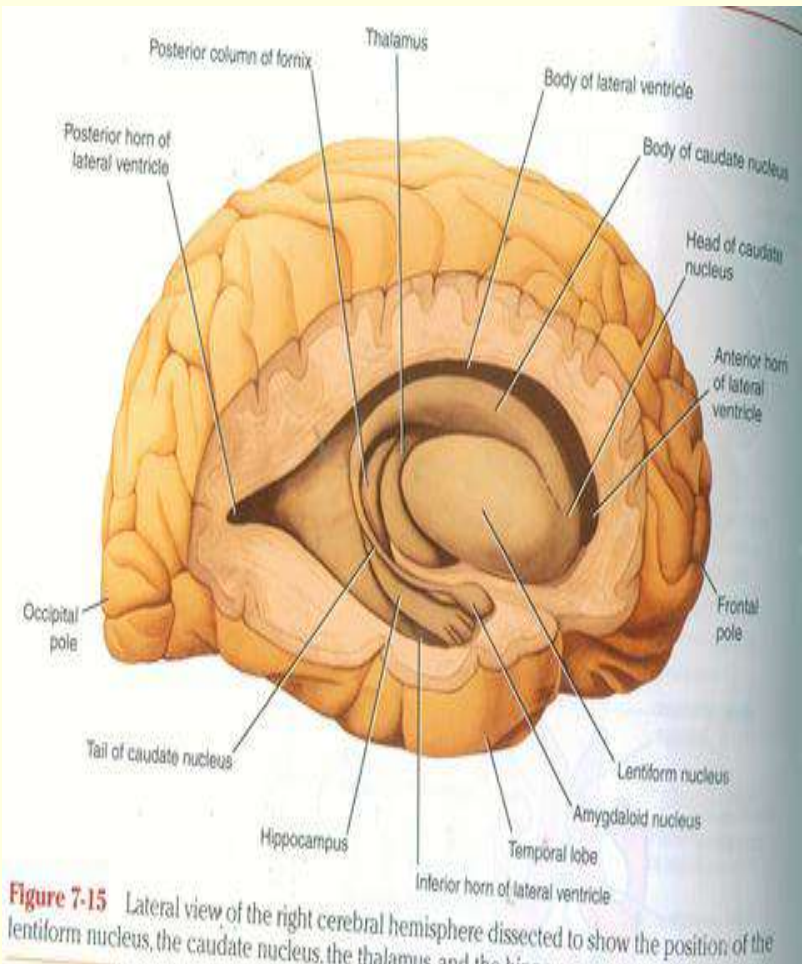


Figure 7-15 Lateral view of the right cerebral hemisphere dissected to show the position of the lentiform nucleus, the caudate nucleus, the thalamus and the hippocampus.

It consist of:

1. Cerebral cortex
2. Lateral ventricles
3. Basal ganglia
4. White matter.

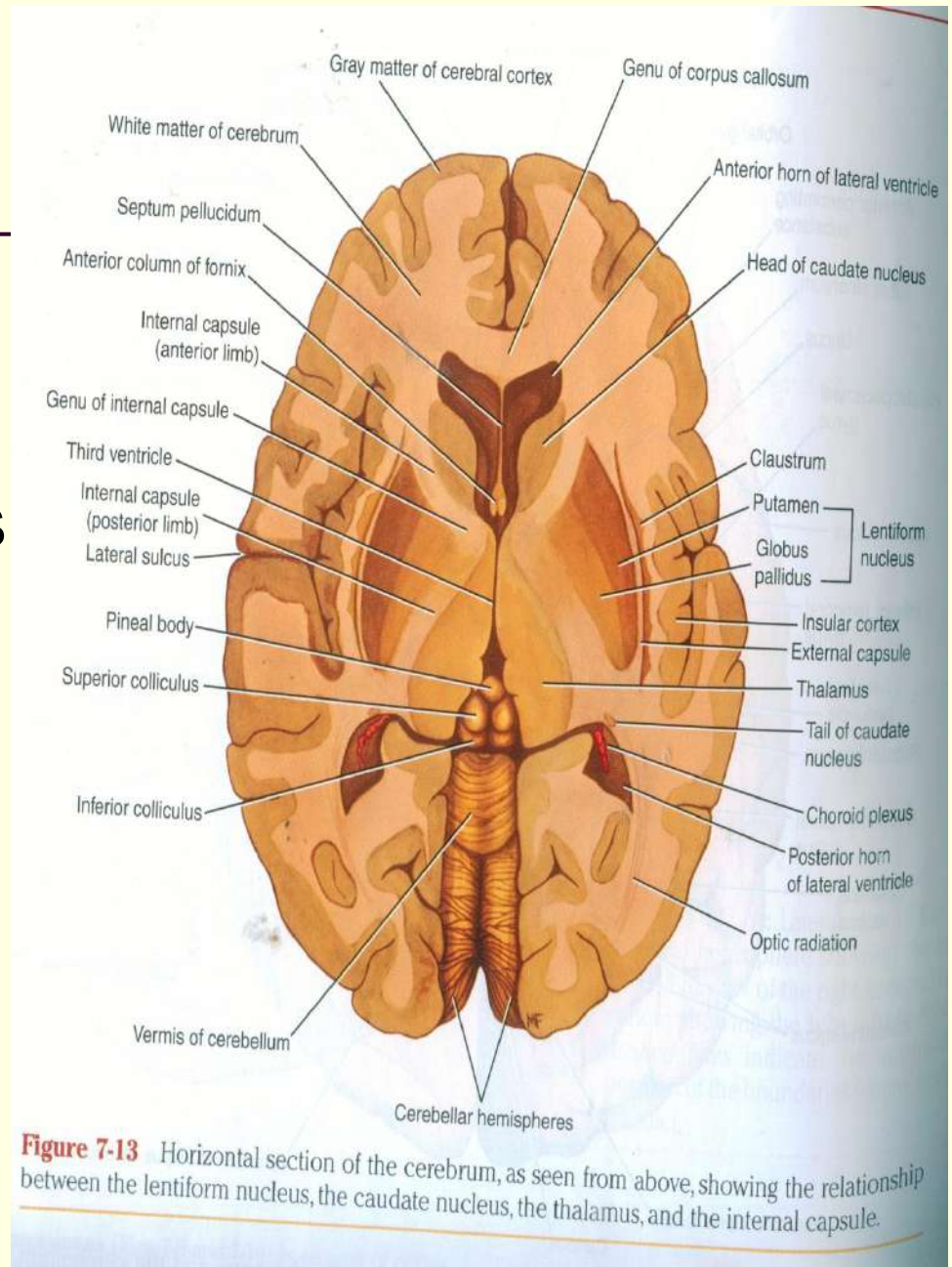
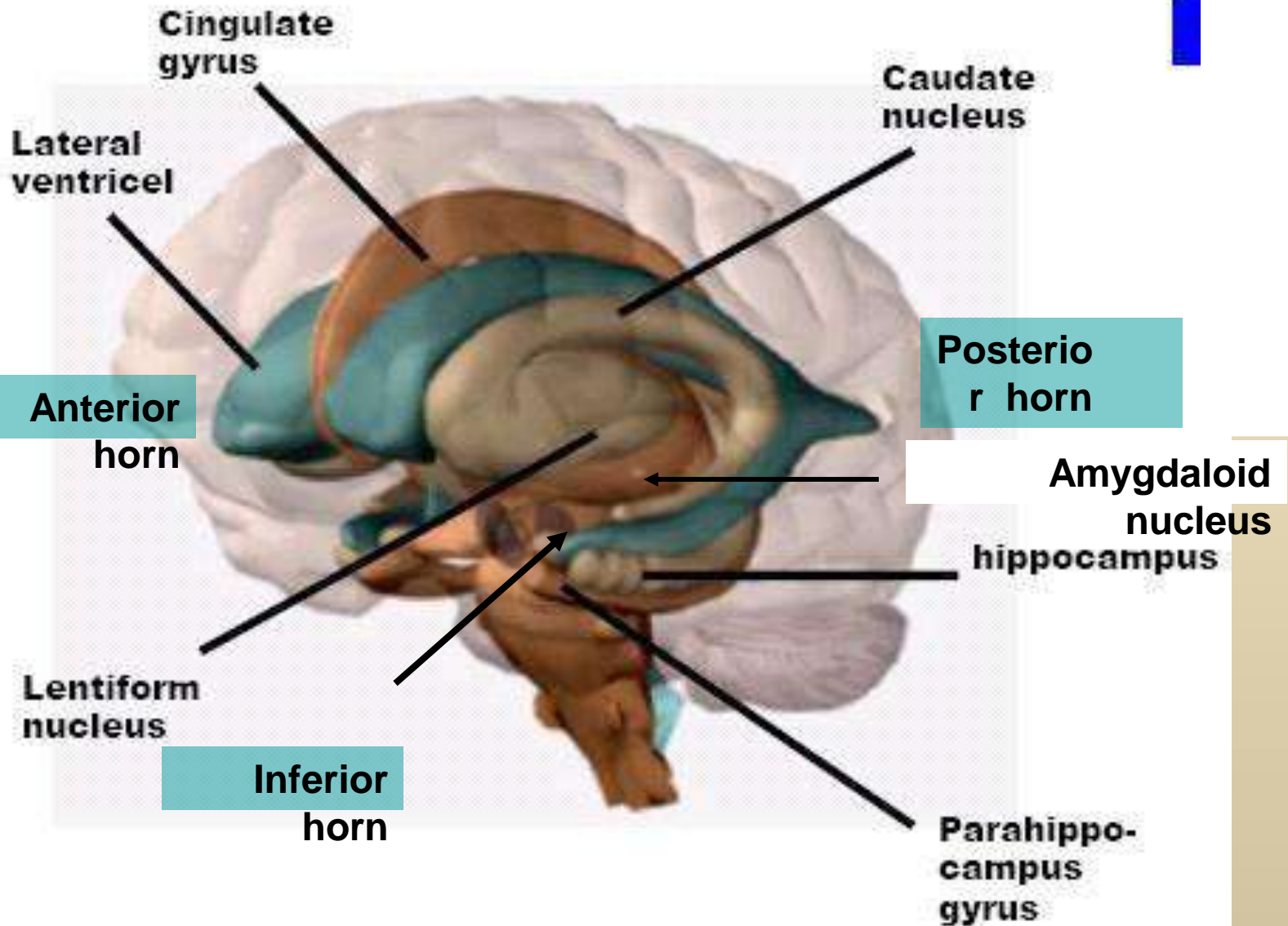


Figure 7-13 Horizontal section of the cerebrum, as seen from above, showing the relationship between the lentiform nucleus, the caudate nucleus, the thalamus, and the internal capsule.



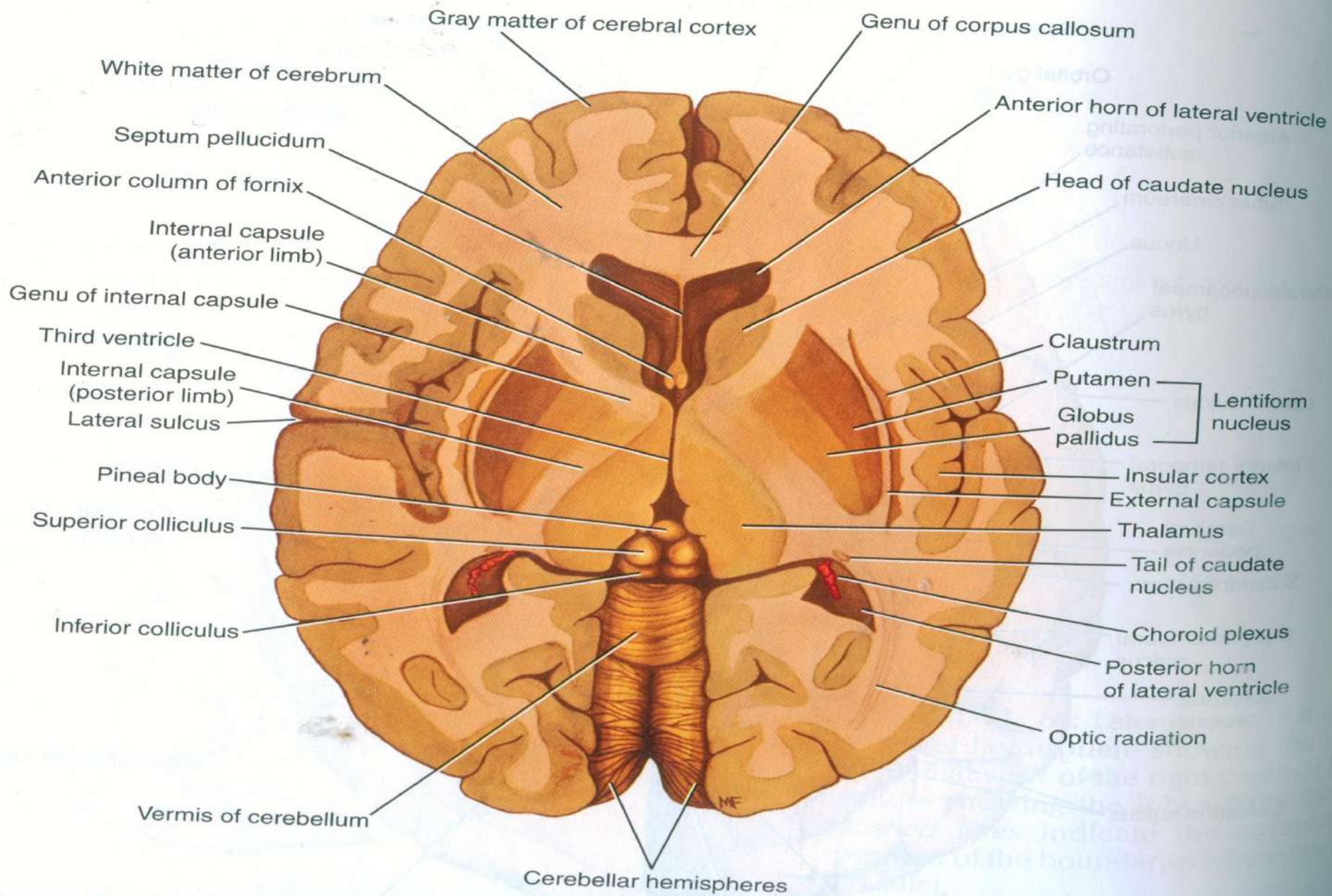


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Basal ganglia

Objectives:

To identify anatomy of basal ganglia

To recognize their connections

To relate their defects to known clinical problems and diseases

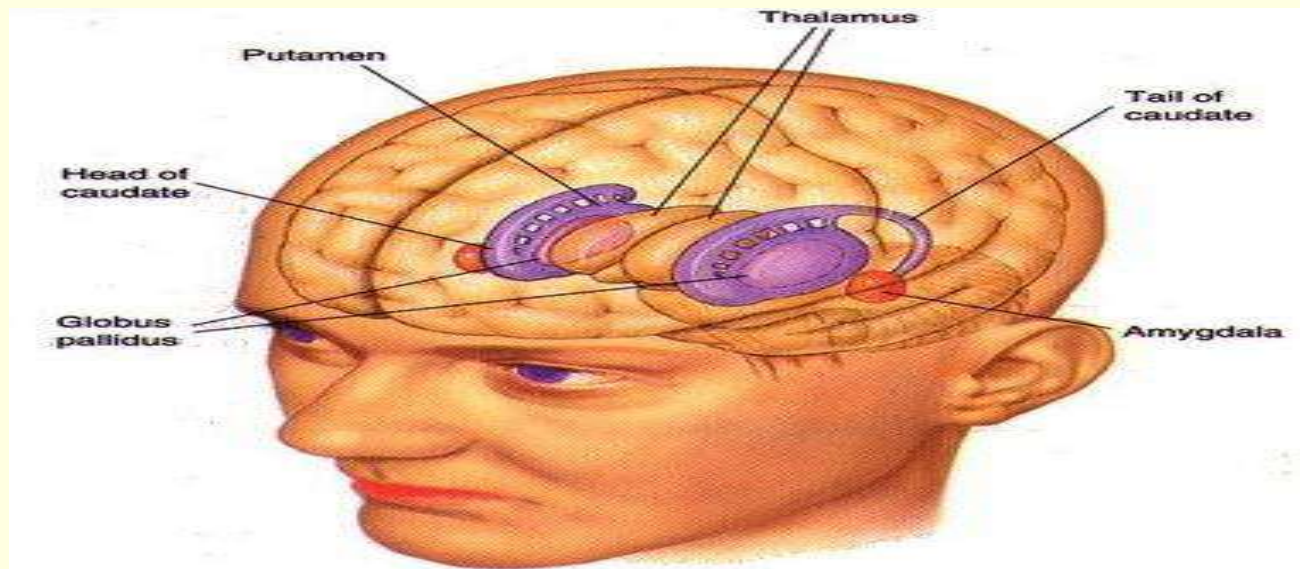
Basal ganglia

- Collection of grey matter masses comprising multiple subcortical nuclei within each cerebral hemisphere

Includes: caudate nucleus, lentiform nucleus

Amygdaloid nucleus, claustrum ??

has important connection with other regions of the brain esp subthalamic nuclei, and substantia nigra

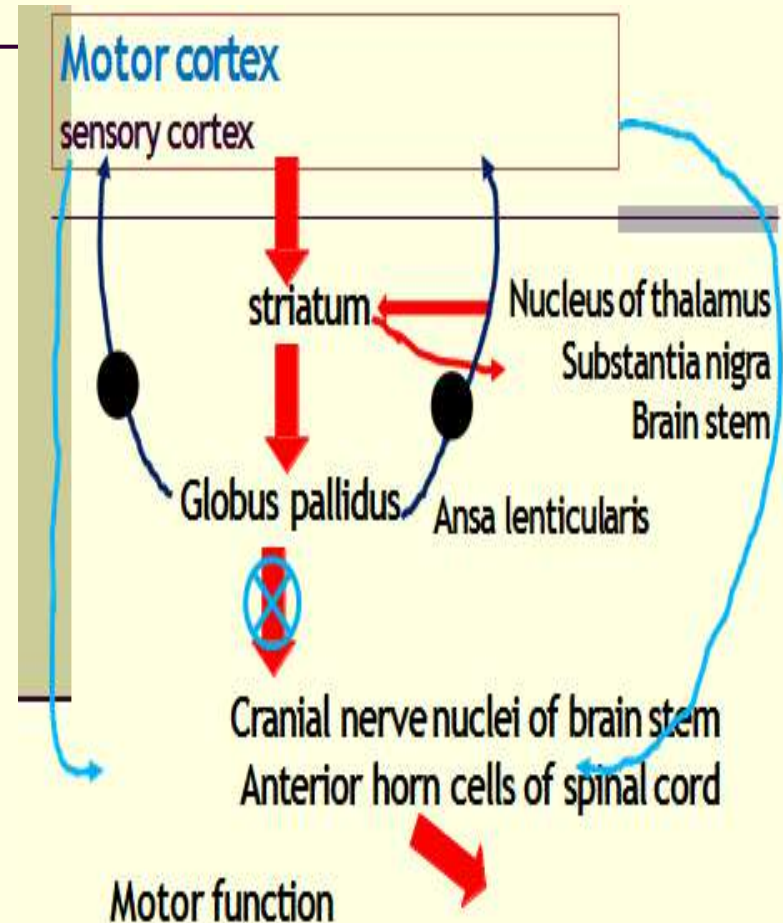


What basal ganglia do?

primary function is likely to control and regulate activities of the motor and pre-motor cortical areas so that voluntary movements can be performed smoothly
= part of extrapyramidal system

1. **Modulate the initiation, termination, amplitude, selection of movement**

*****Initiation and selection**



Traditional classification

- Caudate nucleus •
- Lentiform nucleus •
- Amygdaloid body •
- Clastrum •

Clinical classification

- Caudate nucleus •
- Lentiform nucleus •
- Subthalamus •
- Substantia nigra •



TERMINOLOGIES

Neurological structure	Basal nuclei
Corpus striatum	Caudate nucleus + lentiform nucleus
Amygdala	Amygdaloid nucleus
Clastrum	Clastrum
Neostriatum	Caudate nucleus + putamen
Paleostriatum	Globus pallidus
Caudate nucleus	Caudate nucleus
Lentiform nucleus	Globus pallidus + putamen

Basal ganglia

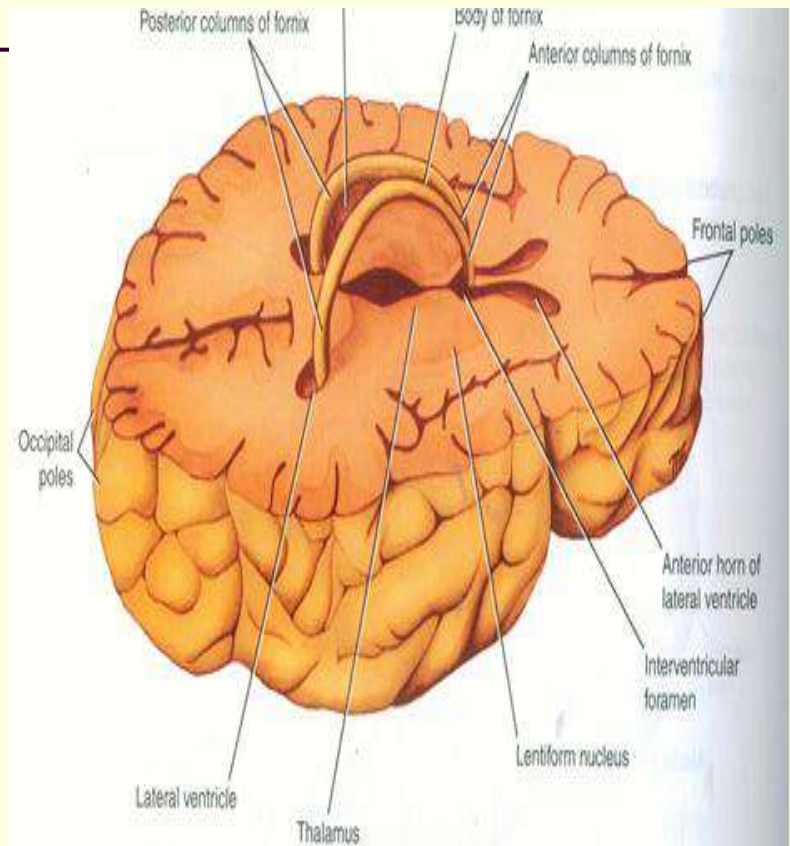
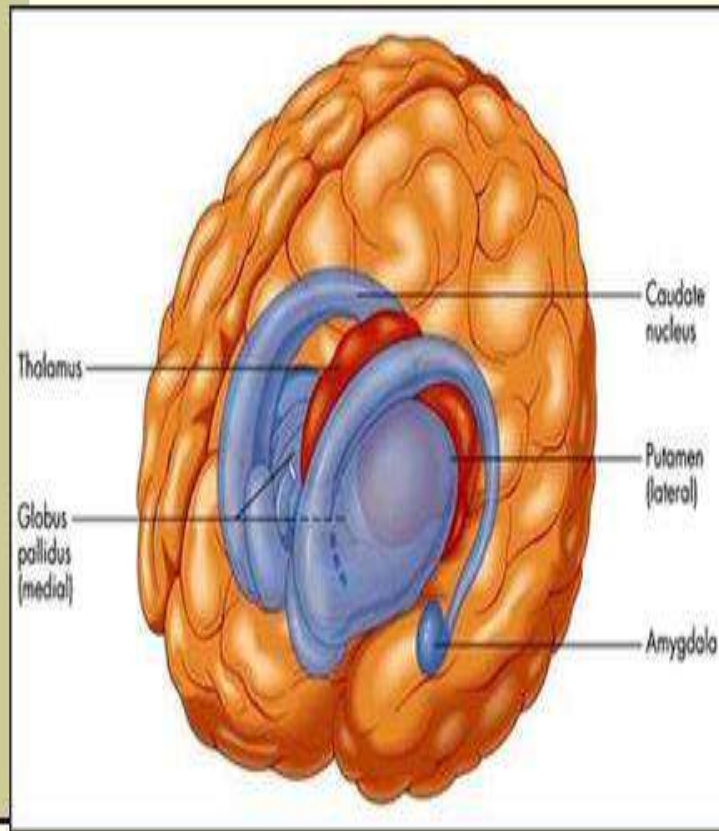
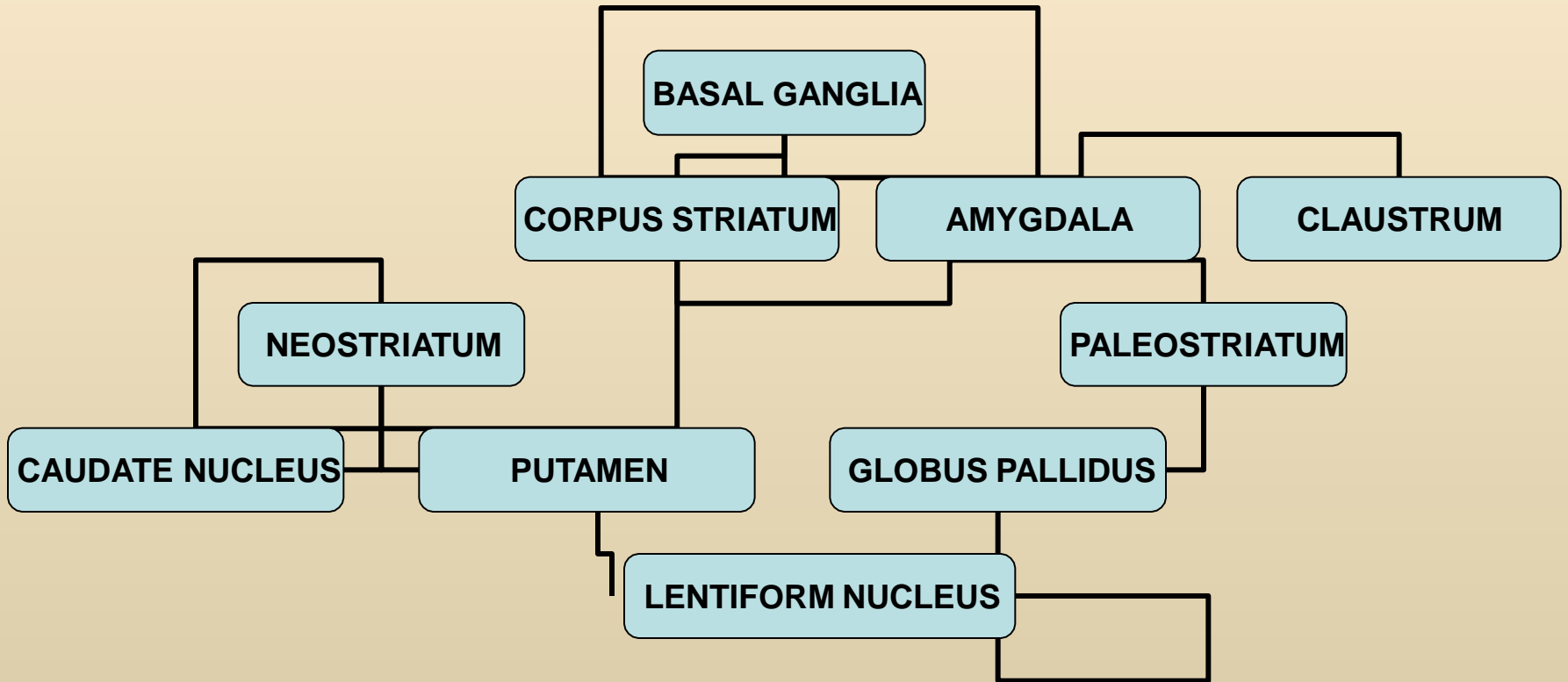


Figure 7-17 Horizontal section of the brain leaving the fornix in position.

Basal ganglia



Basal ganglia

CORONAL SECTION

SUPERIOR

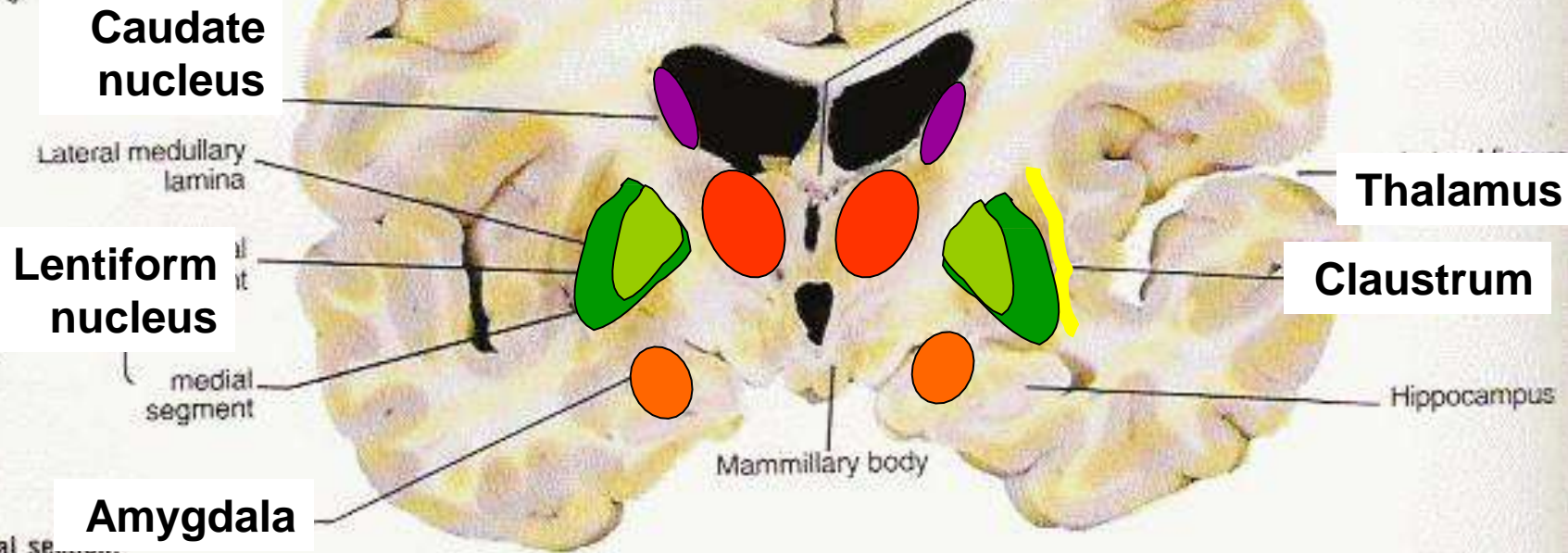
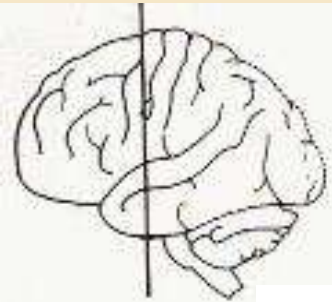


Fig. 10.8 Coronal section.....

INFERIOR

Corpus striatum:

Subdivided by anterior limb of internal capsule into:

Medial part = caudate n.

Lateral part = lentiform n.

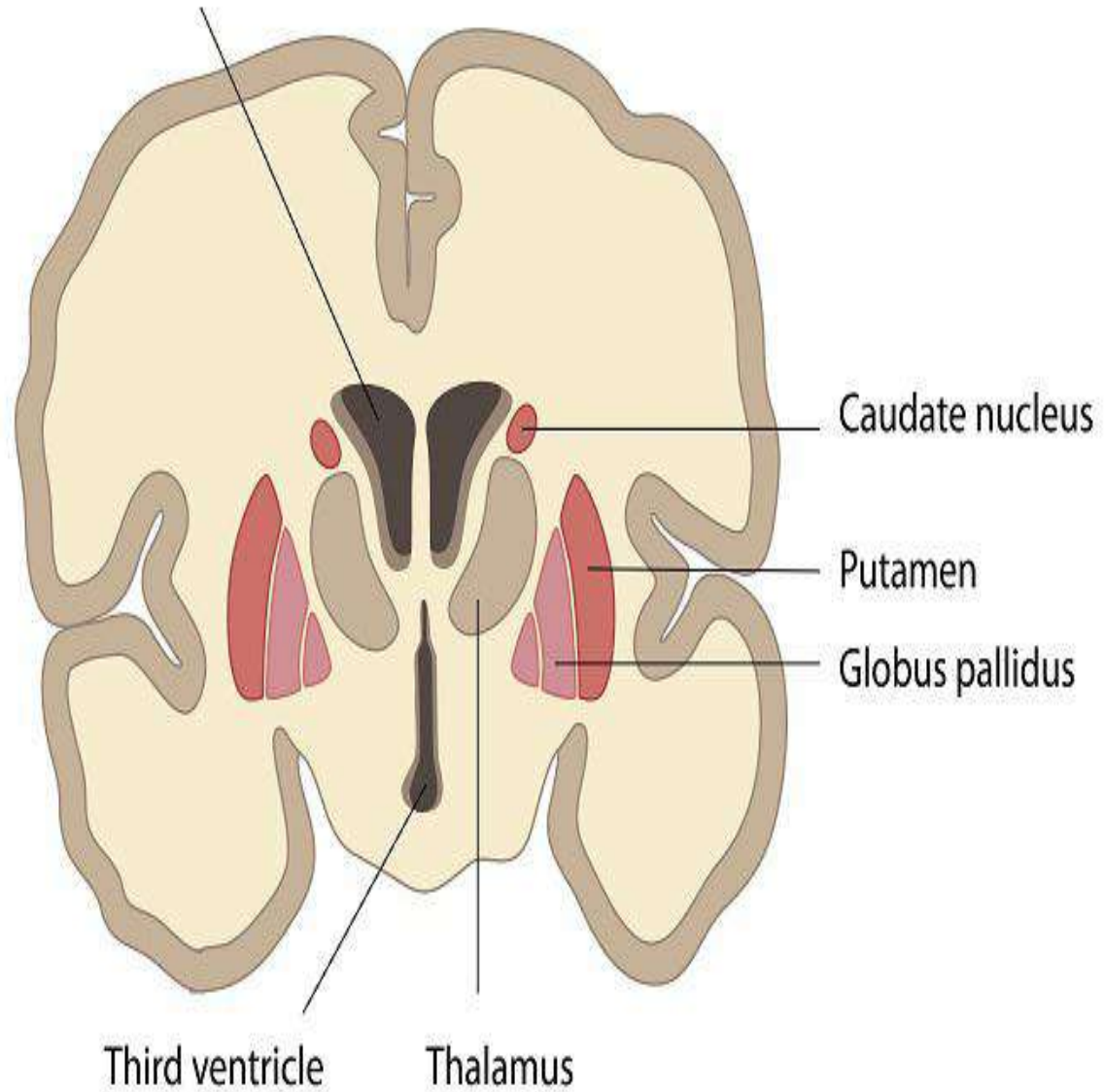
Lies lateral to thalamus

Caudate N + lentiform N + internal capsule = Corpus striatum.

Caudate nucleus;

- C = comma shaped
- have head ,body and tail
- head is situated at the floor of anterior horn of lateral ventricle.
- body at floor of central part of lateral ventricle
- tail at roof of inferior horn of lateral ventricle

Lateral ventricle



Caudate nucleus

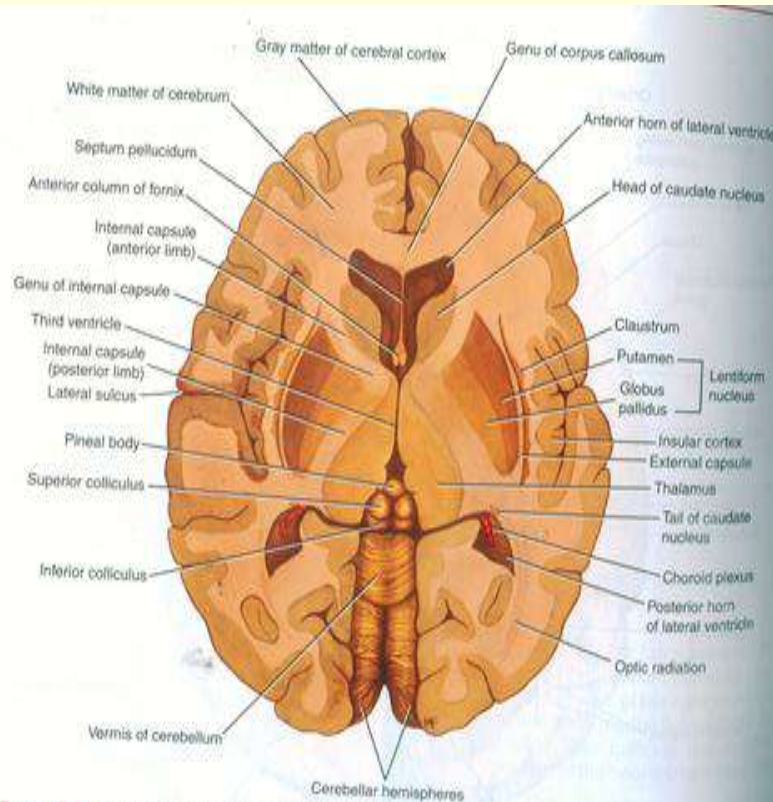
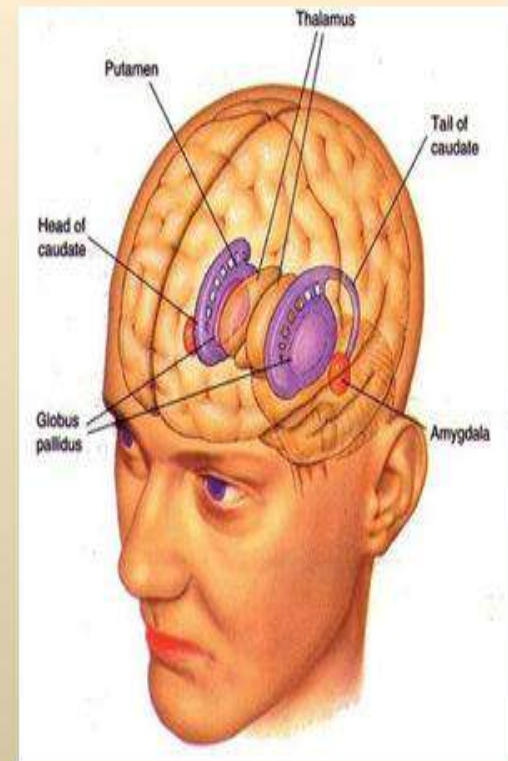
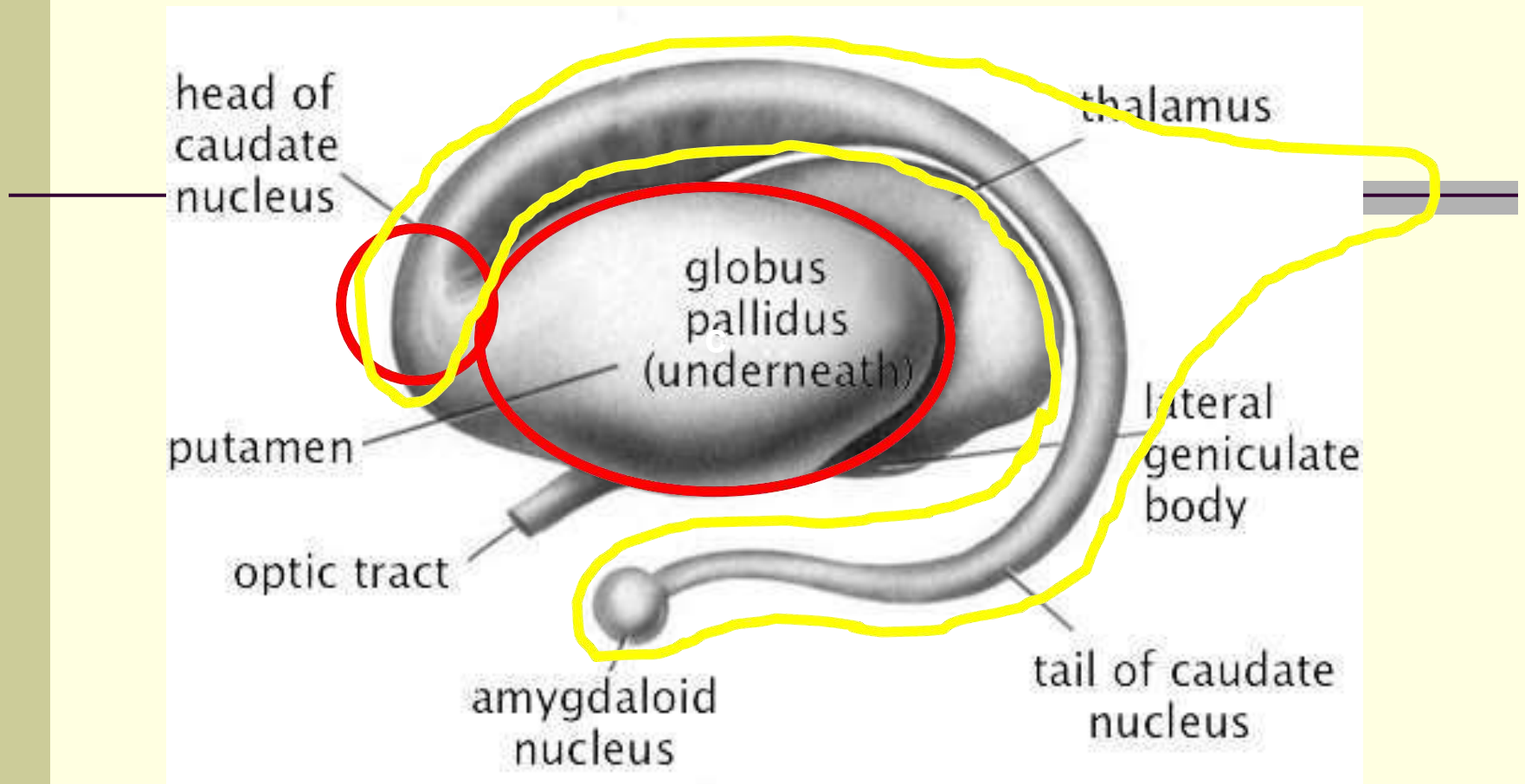


Figure 7-13 Horizontal section of the cerebrum, as seen from above, showing the relationship between the lentiform nucleus, the caudate nucleus, the thalamus, and the internal capsule.





Caudate nucleus

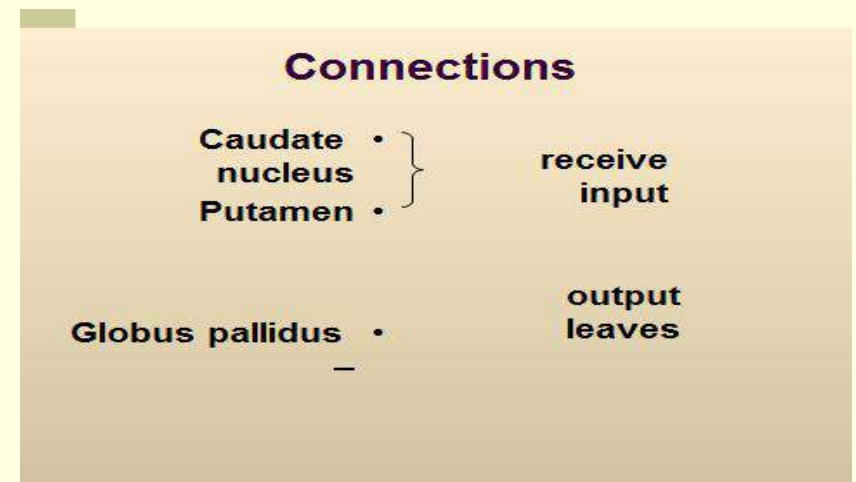
Head – attached with putamen of lentiform nucleus

Body

Tail- attached with amygdaloid nucleus

Lentiform nucleus:

- Biconvex lens = thumb-size
- subdivided into 2 parts
 1. putamen = largest = lateral part = dark
 2. globus pallidus = smaller = medial = pale
- has 2 capsule of white matter external and internal capsule
- Lies beneath insula and claustrum



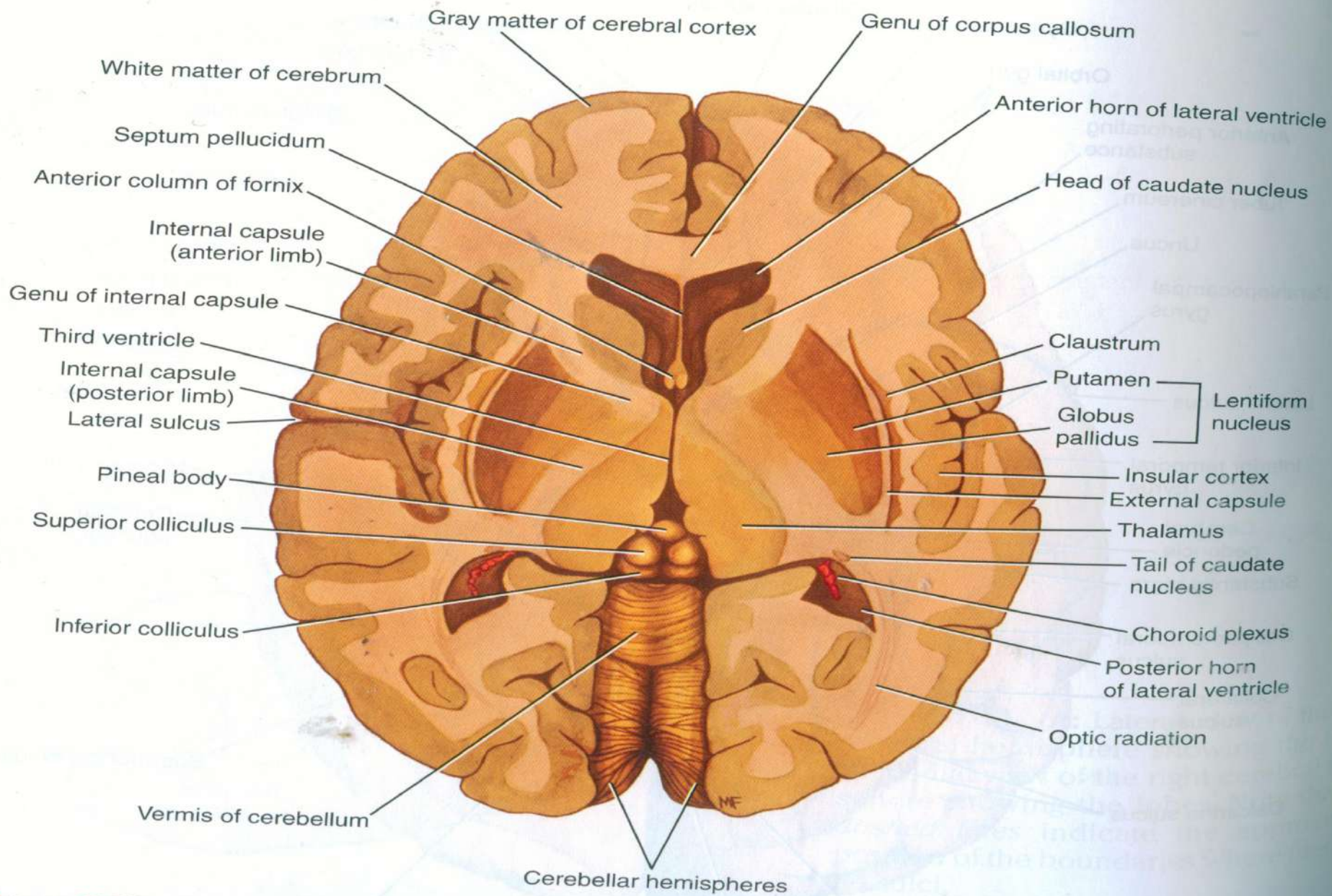
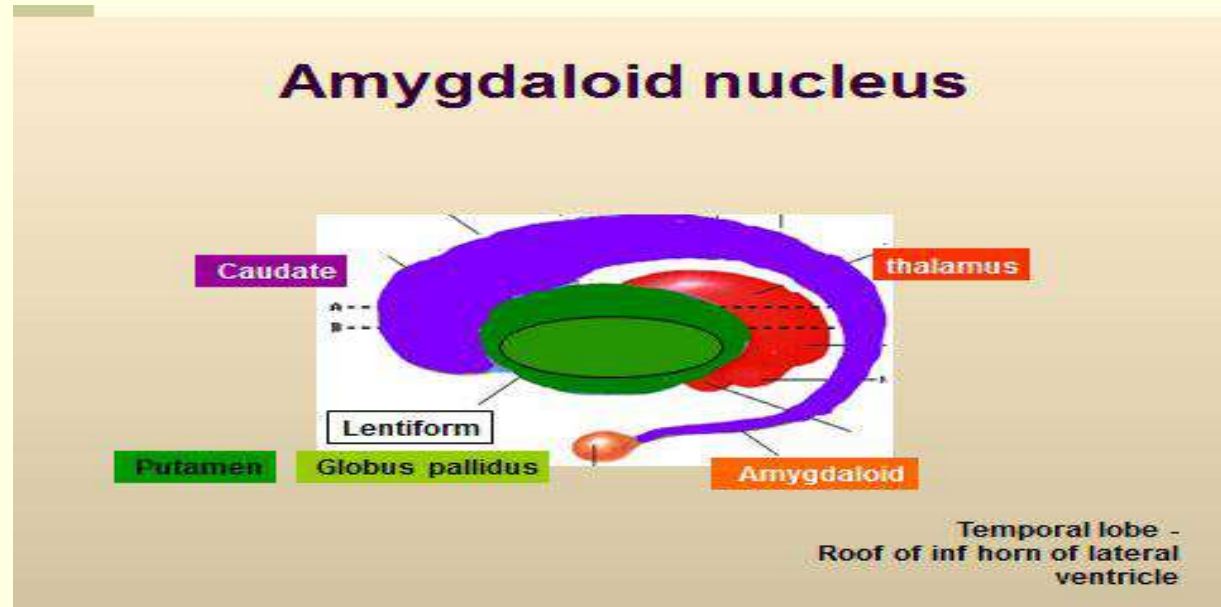


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Amygdaloid nucleus:

- at temporal lobe close to uncus
- roof of inferior horn of lateral ventricle
- extend to tail of caudate n.
- considered as part of limbic system.
- Smell ?



Clastrum:

Thin sheet of grey matter have external capsule
medially and insula laterally

function;

?.

Substantia nigra / Pars compacta (SNc)

Midbrain

Pars reticulata (SNr)

Subthalamic nuclei (STN)

Substantia nigra Subthalamic nuclei

Coronal section

Caudate n

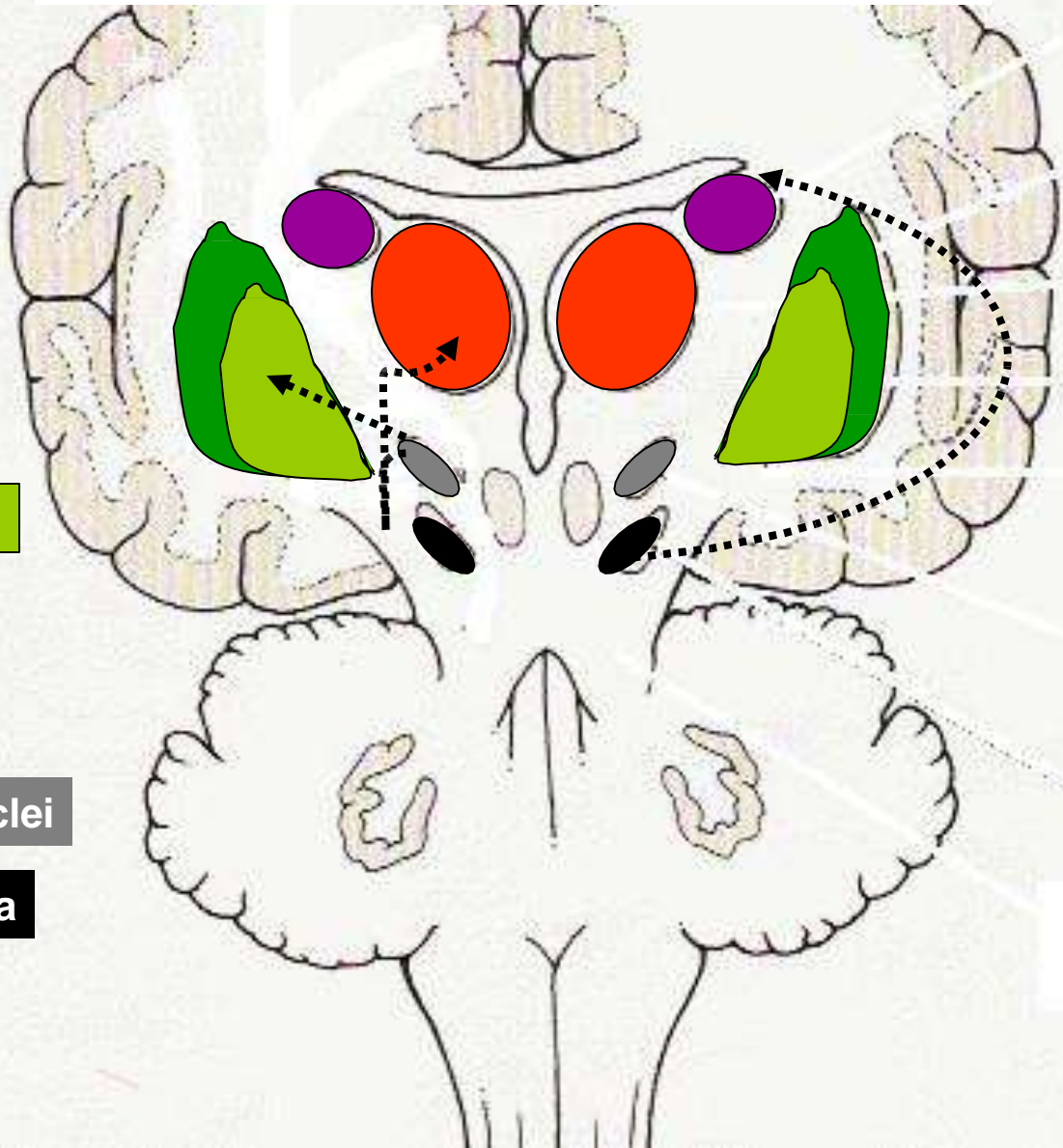
Putamen

Globus pallidus

Thalamus

Subthalamic nuclei

Substantia nigra



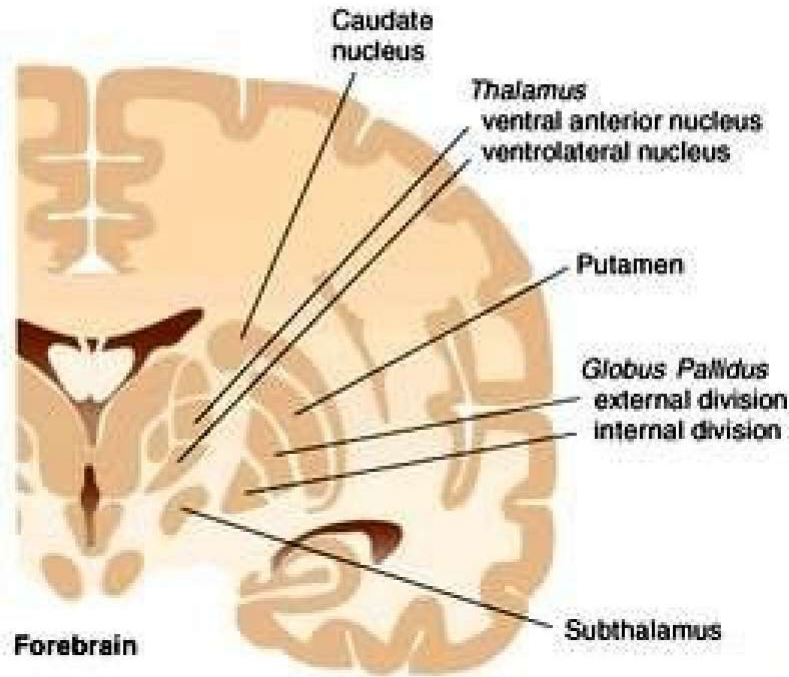
Functions of basal ganglia

The balance between the cerebellum and the basal ganglia allows smooth, coordinated movement, and a disturbance in either system will show up as movement disorders.

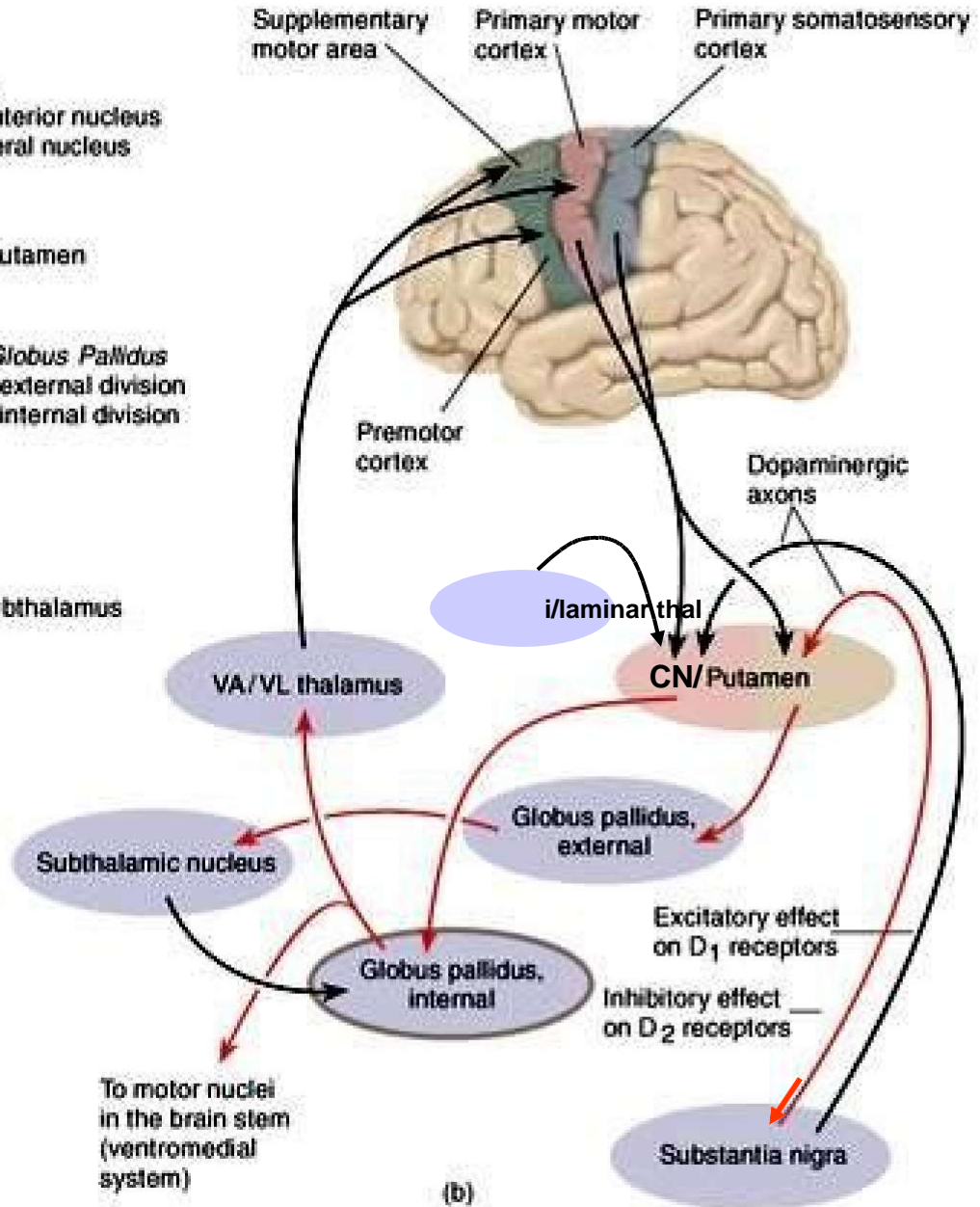
1. Control reflex and voluntary muscular movement
2. Control skilled and manipulated activities of the body e.g. Thread and needle
3. Control abnormal involuntary movement
4. Control emotional expression
5. Control automatic associated movement
e.g; swinging of arms during walking

► The Basal Ganglia

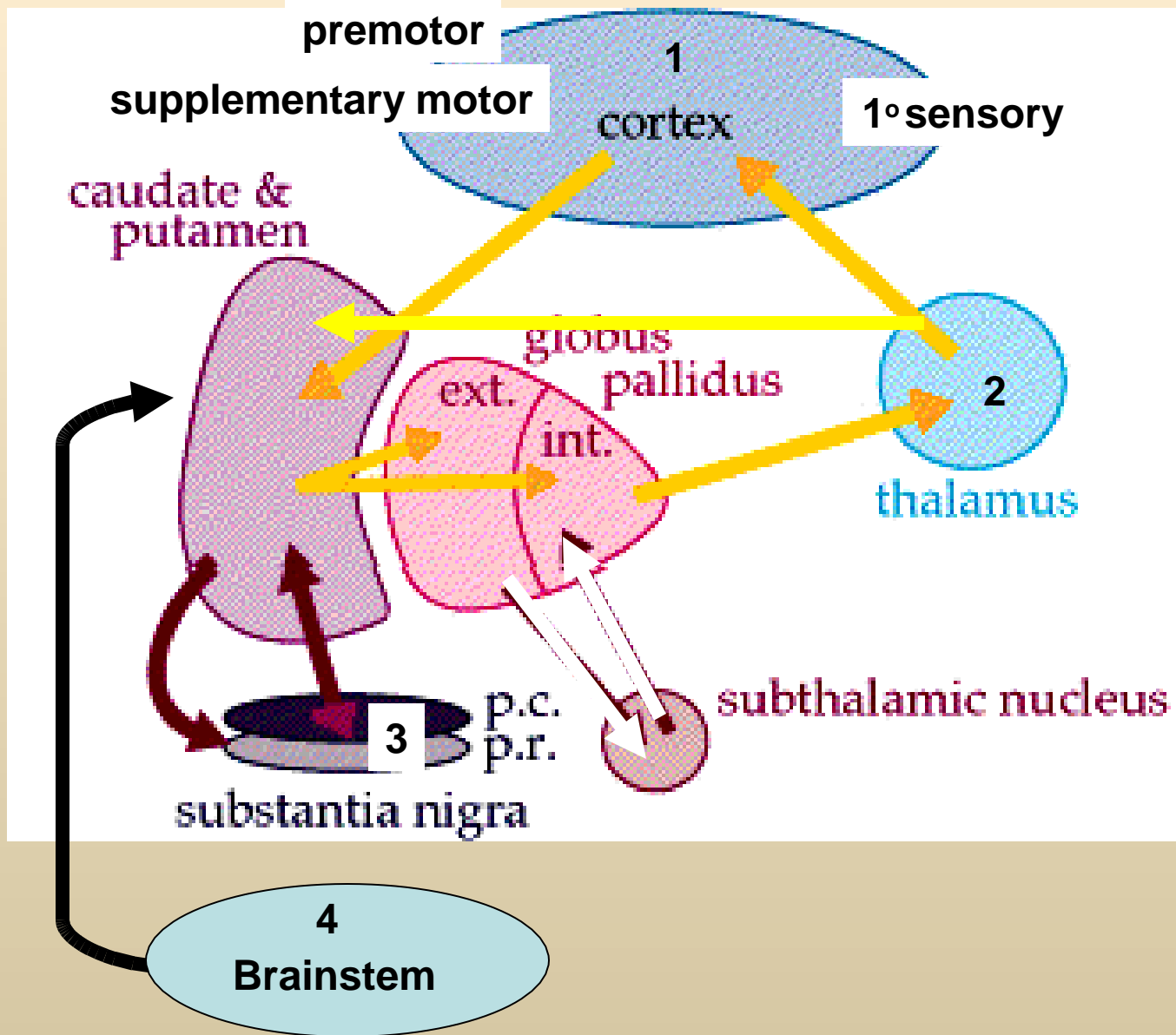
Connections



(a)



(b)



Diseases of basal ganglia

Parkinson's disease



Michael J. Fox



Muhammad Ali



Pope John Paul II



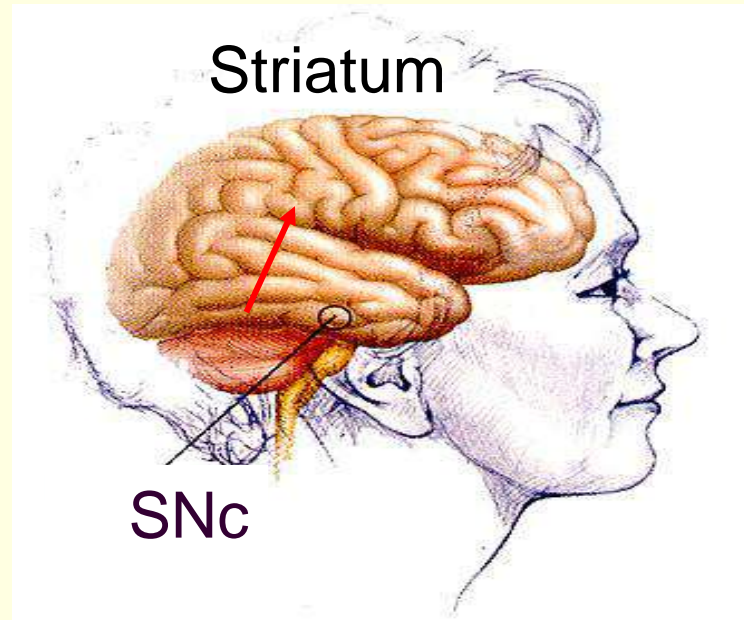
Janet Reno



Katherine Hepburn

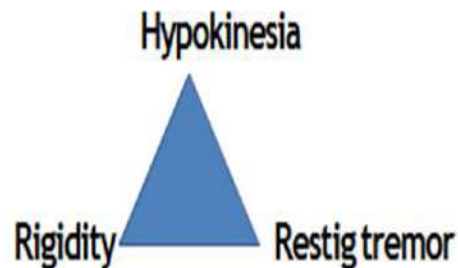
Pathophysiology

Primary: loss of nigrostriatal DA projection



Parkinson disease

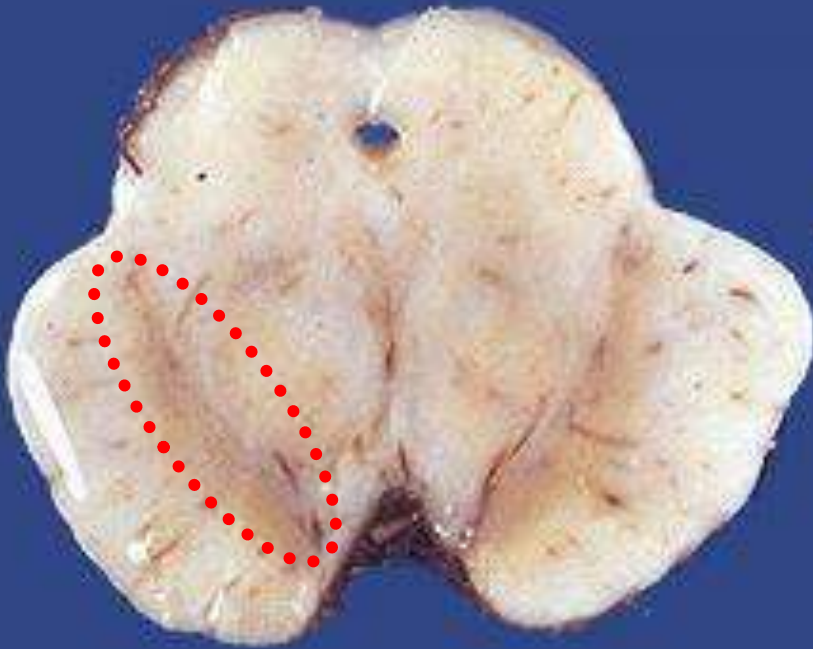
Parkinsonism



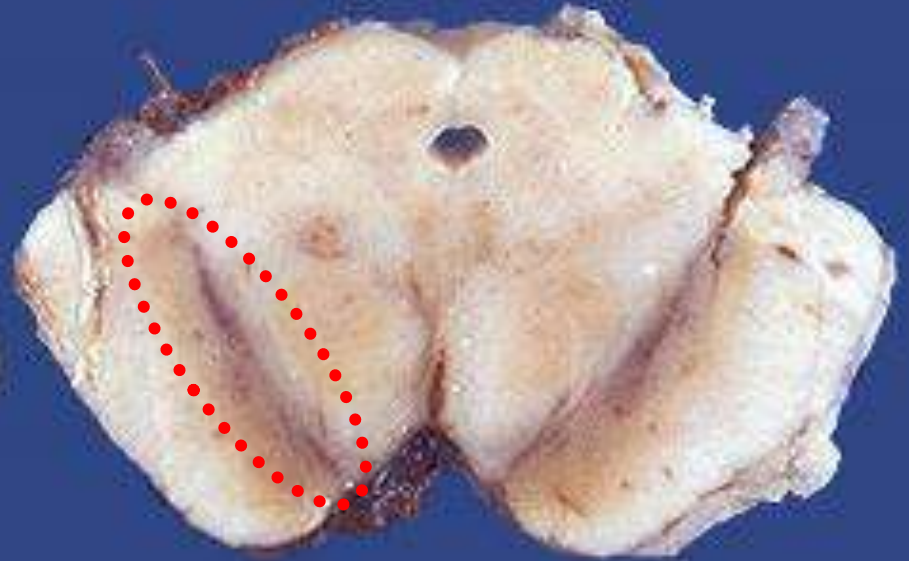
- Release of dopamine from Substantia nigra is less.
- Less activation of direct pathway and less inhibition of indirect pathway
- May be associated with heroine addiction and antipsychotic drugs

- Change in **muscle tone**
- Abnormal **involuntary** movement
- **Parkinsonism**
- **Effect on the opposite side**
- **Degeneration of dopamine-producing cells in substantia nigra-depletion of dopamine in striatum**
- **Resting tremor**
- **Rigidity – simultaneous contraction of flexors and extensors**
- **Bradykinesia = Slowness of movement – brake cannot be released**
- **Depression , dementia**
- **No paralysis, sensory loss, ataxia**

Human midbrain



Parkinson's
disease



Normal

Choreatic syndrome

Huntington's disease

- hereditary disease of unwanted movements.
- It results from degeneration of the caudate and putamen, and produces continuous dance-like movements of the face and limbs – choreoathetosis

Hemiballism

flailing movements of one arm and leg (one-sided), which is caused by damage (i.e., stroke) of the subthalamic nucleus



Huntington's disease

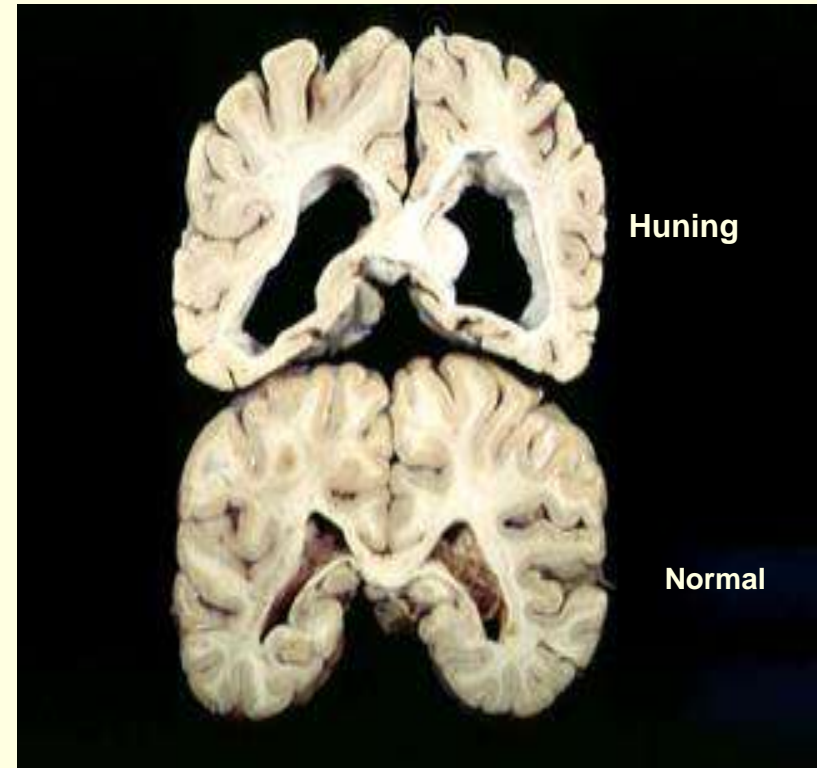
Hyperkinetic disorders:

Pathophysiology

- *Atrophy of striatum •
- *Loss of striatal GABAergic neurons •
- *Neuropathological sequence •

1st: loss of striatal GABA/enkephalin/D2-R neurons (*indirect pathway*)

2nd: loss of striatal GABA/ dynorphin/D1-R neurons (direct pathway) & cortical atrophy



Lower Motor Neuron	Upper Motor Neuron	Basal Ganglia
Paralysis	Paresis (weakness)	No paralysis
Muscle atrophy	No atrophy	No atrophy
Areflexia & atonia	Hyperreflexia, hypertonia, spasticity	Parkinson's: rigidity, resting tremor, bradykinesia Huntington's: chorea, hyperkinesia
Ipsi deficit in spinal cord	Contra deficit above decussation Ipsi deficit below decussation	Contra