…By the way, where is the fornix???

Introduction to gross neuroanatomy

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Resources

- Digital anatomist:
- Sylvius:

Some slides kindly provided by E. Duerden, UMontreal.

All images and animations included in this presentation are from the Digital Anatomist website, unless otherwise specified.
Orientation

In animals with a linear organization of the CNS:

- **VENTRAL** = towards the belly (=‘ventrum’ in latin)
- **DORSAL** = towards the back (=‘dorsum’ in latin)
- **ROSTRAL** = towards the snout (=‘rostrum’=beak in latin)
- **CAUDAL** = towards the tail (=‘cauda’ in latin)
Orientation

Humans, however, have an upright posture...

Watch out! ‘Superior’=‘Dorsal’ above the midbrain; =‘Rostral’ in the midbrain or below
Orientation

**MEDIAL** = close to the midline
**LATERAL** = close to the sides
Orientation

Horizontal (axial/transverse)  Coronal  Sagittal

Think about the horizon!  Imagine a tiara-like crown!  Think about the bow of an archer!

Orientation

Horizontal (axial/transverse)
Think about the horizon!

Coronal
Imagine a tiara-like crown!

Sagittal
Think about the bow of an archer!
Major subdivisions of the encephalon

Telencephalon
- Cereb. Hemispheres (including cortex and subcortical structures)

Diencephalon
- thalamus
- hypothalamus
- other associated structures

Brainstem
- Midbrain (mesencephalon)
- Pons*
- Medulla oblongata (myelencephalon)

Cerebellum*

* Pons + cerebellum = metencephalon
The brainstem

- Midbrain
- Pons
- Medulla Oblongata
The brainstem
The brainstem

- Midbrain
- Pons
- Medulla Oblongata

- Sup. colliculus
- Inf. colliculus
- Cerebellar Peduncles
The brainstem

- Midbrain
- Pons
- Medulla Oblongata
- Cerebellum
The brainstem

TIPS for the MRI reader:

I can see two ventral ‘bumps’ (PYRAMIDS)

Lateral to these, two more subtle ‘bumps’ (INF. OLIVES)

I am the level of the MEDULLA!
The brainstem

TIPS for the MRI reader:

I can see the large ‘belly’

I am the level of the PONS!
The brainstem

TIPS for the MRI reader:

I see MICKEY!
(the ears=cerebral peduncles)

I am the level of the MIDBRAIN!
The diencephalon

Thalamus

Hypothalamus

Hypothalamic sulcus
The diencephalon

The ICECREAM tip: Thalamus is the SCOOP, the hypothalamus the CONE!
The diencephalon

- Infundibulum of the Pituitary gland
- Mammillary bodies
- Hypothalamus lies dorsal to these structures
- Optic chiasm
The diencephalon

- Optic chiasm
- Infundibulum of the pituitary gland
- Mammillary bodies
The diencephalon

Thalami
The diencephalon
The ventricular system

- Lateral v.
- Third v.
- Cerebral aqueduct
- Fourth v.
The ventricular system

- Fourth ventricle (between pons/upper medulla and cerebellum)
- Third ventricle (between the 2 thalami; & at the center of the hypothalamus)
- Lateral ventricles (inside the hemispheres)
- Cerebral aqueduct (tiny canal inside the midbrain)
- Fourth ventricle (between pons/upper medulla and cerebellum)
The ventricular system

- Thalamus
- Hypothalamus
- Midbrain
- Pons
- Medulla Oblongata
- Cerebellum

Key Structures:
- Foramen of Monro
- Third ventricle
- Cerebral aqueduct
- Fourth ventricle
Cerebral Hemispheres

- 2 hemispheres, interconnected by: corpus callosum, anterior commissure, posterior commissure and (in some individuals) interthalamic adhesion.

- Corpus callosum
- Anterior Commissure (tip: rostral to the fornix!)
- Posterior commissure (tip: dorsal to the top of the aqueduct!)
Cerebral Hemispheres

• 2 hemispheres, interconnected by: corpus callosum, anterior commissure, posterior commissure and (in some individuals) interthalamic adhesion.

• In each hemisphere: cortex (gyri, sulci), white matter and subcortical structures (including hippocampus, amygdala and basal ganglia).
Cortex

- 4 lobes: FRONTAL, PARIETAL, TEMPORAL and OCCIPITAL
- Each lobe composed of GYRI (the ‘HILLS’) and SULCI (the ‘VALLEYS’)
- If a sulcus is very deep ➔ FISSURE (EX. Lateral fissure)
- Some sulci run LONGITUDINALLY, others in a MEDIAL-LATERAL direction
Cortex
Cortex

Post central gyrus
Superior parietal lobule
Precentral gyrus
Superior frontal gyrus
Middle frontal gyrus
Inferior frontal gyrus
Superior temporal gyrus
Middle temporal gyrus
Inferior parietal lobule
Lateral sulcus
Inferior temporal gyrus

From Emma Duerden, with permission
Cortex

Tips to find the central sulcus:

1) SFS stops at the precentral gyrus;
2) Look for the ‘Omega shape’ (motor hand area)
Cortex

Tip to find the intraparietal sulcus:

The lateral fissure and superior temporal sulcus stop at the Inf par lobule.
Cortex

Cortex

- Cingulate gyrus
- Parieto-occipital fissure
- Calcarine fissure
- Cuneus
- Lingual gyrus
- Uncus
- Parahippocampal gyrus

From Emma Duerden, with permission
Cortex

From Emma Duerden, modified, with permission
Heschl’s (transverse) gyri

From Emma Duerden, modified, with permission
Tip to find the hippocampus: Look below the inferior horn of the lateral ventricle!
Hippocampus

The fornix connects the hippocampus to the mammillary bodies

Hippocampus and Amygdala

Tip to find the amygdala: Look rostral to the hippocampus!
The basal ganglia

Caudate nucleus

Lentiform nucleus (=putamen + globus pallidus)

The basal ganglia
The basal ganglia

Tips to find the basal ganglia:
1) Look for the L shaped white matter (internal capsule)!
2) ‘Pallidus’ means ‘pale’....

**Anterior limb** of the Internal capsule:
- separates caudate from lentiform nucleus

**Posterior limb** of the Internal capsule:
- separates thalamus from lentiform nucleus

- Caudate n. (head)
- Lentiform nucleus (putamen)
- Lentiform nucleus (globus pallidus)
- Thalamus
The basal ganglia

Tips to find the basal ganglia:
1) look for the L shaped white matter (internal capsule)!
2) ‘Pallidus’ means ‘pale’....
Thanks!