Part I
Sectional Anatomy Overview of the Brain & Spine

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Outline

Part I
• Planes of the Brain & Spine
• Sectional Anatomy of the Brain
• Sectional Anatomy of the Spine

Objectives

Part I
Upon completion of this course, the attendee should...
1. Learn about planes of the brain & spine
2. Learn sectional anatomy of the brain
3. Learn sectional anatomy of the spine

Imaging Planes for CT & MR Images
Cranial Bones & Brain Lobes

The 5th lobe of the brain is known as the Insula. It is located "inside" the Sylvian (Lateral) Fissure.

Brain Anatomy: Mid-Sagittal

What separates the lobes?

Sylvian Fissure or Lateral Fissure... Separates the Frontal lobe from the parietal lobe. Inside is the 5th lobe of the brain, the "Insula" & the MCA.

Tentorium... Separates cerebrum from cerebellum

Longitudinal fissure... Right and left lobes (inside is the Falx Cerebri).

Ventricles as landmarks?

The red lines indicate the approximate location of the sagittal slice.

Ventricles make up the "face" within the brain.
**Ventricular Pathology**

- Subdural hematoma
  - Midline shift
  - Axial CT

- Hydrocephalus
  - Axial CT
  - Axial T2W MR images

**What flows into what?**

- Anterior Horns
- Lateral Ventricle
- Interventricular foramen
- 3rd ventricle
- Posterior Horns

**Brain Anatomy: CSF Flow**

- Choroid plexus
  - Anterior horns of the lateral ventricles
  - Posterior horns of the lateral ventricles

- Interventricular foramen
  - Between lateral ventricles & 3rd ventricle

- 3rd ventricle
  - Lateral walls, made up of the thalamus

- Cerebral Aqueduct (aka Aquiduct of Sylvius)
  - Between 3rd vent & 4th ventricle

- 4th ventricle
  - Located anterior to cerebellum

- Aqueducts to the cerebellum & cord

- Aqueduct of Magendie
- Aqueduct of Lushka

**Ventricular System - A closer look…Slice #1**

- Anterior horns of the lateral ventricles
- Choroid plexus
- Posterior horns of the lateral ventricles

- Interventricular foramen

- 3rd ventricle
- Posterior horns of the lateral ventricles

- Aqueduct of Magendie
- Aqueduct of Lushka
Middle Cerebral Artery

Brain Anatomy: Venous Flow

Brain Anatomy: Gray & White Matter

Brain Anatomy: Corpus Callosum
Hint: we know that we are in the midline when we see the spinal cord.

Hint: we know that we are in the midline when we see the pituitary and sella Turcica.

- Cerebral peduncles
- Pons
- Medulla
- Spinal Cord

- Anterior horn
- Lateral ventricle
- Thalamus
- Third ventricle
- Optic chiasm
- Pituitary stalk
- Pituitary gland
- Clivus
- Sella turcica

- Maxillary Sinus
- Teeth

- Sylvian (lateral) fissure
- MCA flow through
- The Insula is inside

- Sulci
gyri
**Axial (Transverse) Plane**

Slide # 25

**Brain Anatomy: Axial Superior**

Slide # 26

**Brain Anatomy: Axial @ Ventricles**

Slide # 27

**Brain Anatomy: Axial Basil Ganglia**

Slide # 28
Brain Anatomy: Basil Ganglia

- Caudate nucleus (Gray Matter)
- Lentiform nucleus (Gray Matter) (Globus pallidus & Putamen)
- Thalamus (Gray Matter)

Just because the structure is gray, does not automatically make it gray matter!

Axial Proton Density MR Image

Brain Anatomy: Axial – Corpus Callosum

- Corpus callosum genu
- Corpus callosum splenium

Axial CT image

Axial PDW MR image

Brain Anatomy: Midbrain

- Frontal Lobe
- Fissure Calcaris
- Sylvian Fissure
- Temporal lobe
- Central peduncles
- Red nucleus
- Central Aqueduct
- Vermis
- Cerebellum
- Occipital Lobe

Axial CT image

Axial MR image

Pathology at the level of the Ventricles

- Bone
  - Cortical Bone: 800
  - Petrous Bone: 3000
  - Average Bone: 1000
- Blood
  - Fresh: 20-50
  - Clotted: 50-75
- Air: -1000
- Lungs: -150 to -850
- Water: 0
- Fat: -100

MCA occlusion
Brain Anatomy: Axial Orbits

- Basilar Artery
- Pons
- 4th ventricle
- Mastoid air cells
- Cerebellum

Axial CT image
Axial MR image

This red line indicates the location of the axial slice.

Brain Anatomy: Axial Orbits

- Frontal sinus
- Orbit
- Nasal conchae
- Sphenoid sinus
- Temporal lobe
- Basilar artery
- Pons
- 4th ventricle
- Mastoid air cells
- Cerebellum

Axial CT image
Axial MR image

This red line indicates the location of the axial slice.

Brain Anatomy: IAC’s

- Temporal lobe
- Temporal bone
- IAC
- Mastoid air cells
- 7th & 8th cranial nerves

Axial CT image
Axial MR image

This red line indicates the location of the axial slice.

Brain Anatomy: IAC’s

- Lens
- Globe of the eye
- Optic nerve
- Lateral rectus muscle
- Lt. Medial rectus muscle
- Temporal lobe

Axial CT image
Axial MR image

This red line indicates the location of the axial slice.
Coronal Plane

- Sagittal
- Axial
- Coronal

Coronal slice more anterior
Coronal slice more posterior
Coronal slice very posterior

Coronal Plane

Coronal Facial Bone Anatomy

- Crista galli
- Cribriform plate
- Orbital roof
- Nasal conchae
- Maxilla
- Mandible
- Fracture

Coronal Oblique CT

Coronal CT reformatted image of Trauma

Coronal Through Pituitary Gland

- optic chiasm
- pituitary stalk
- lateral ventricles
- septum pellucidum
- temporal lobes

Coronal Through Pituitary Gland

- parietal lobe
- longitudinal fissure
- pituitary gland (w/tumor)
- pit stalk (infundibulum)
- optic chiasm
- lateral ventricles
- septum pellucidum
- temporal lobes

Coronal Through Pituitary Gland

Coronal CT
Coronal MR

Brain Anatomy Coronal Posterior

- Cisterna Ambiens w/Pineal gland
- Cerebral aqueduct
- Tentorium
- 4th ventricle
- Cerebellum

Brain Anatomy Coronal Posterior

Coronal CT image
Coronal MR image
Image Fusion

- MRI + CT
- Pre therapy

MRI + CT fusion

Imaging Planes

CT Images
- Mid-sagittal Plane
- Parasagittal Plane
- Transverse Or Axial Plane

MRI Images
- Sagittal
- Axial
- Coronal

Median Line
Mid-sagittal Plane
Parasagittal Plane
Transverse Or Axial Plane

Image Comparison in the C-spine

Lateral radiograph
Sagittal CT
Sagittal T1 MRI

Slice location

Spinal Anatomy Brachial Plexus & Lumbar Plexus

Fracture
Brachial plexus
Cervical vertebrae
Lumbar vertebrae
Lumbar plexus
Sacral plexus
Sacrum
**Spinal Anatomy Vertebral bodies & Intervertebral disks**

- SAGITTAL MRI
- SAGITTAL CT

**Imaging Planes – C Spine & Neck**

- Axial CT image
- Axial MR image

**“C-spine”**

- CT AXIAL
- MRI AXIAL

**“Arnold Chiari Malformation”**

- SAGITTAL MRI