Overview of Basic Neuroanatomy and Cerebrovascular Anatomy

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Overview of Neuroanatomy and Cerebral Vasculature

• Basic 3D relationships of central nervous system structures

• Most clinically relevant pathway
  Corticospinal pathway: voluntary motor control

• Cervical and intracranial cerebral vasculature

• Foundation for understanding acute ischemic stroke

  Clinical stroke syndromes
  Stroke imaging
  Rationale for medical and endovascular stroke treatment
  Acute therapies, secondary prevention
Overview of Neuroanatomy

- Brain
  - Cerebral Cortex
  - Deep Nuclei
- Brainstem
- Spinal Cord
Overview of Neuroanatomy – Orientation is Important
Overview of Neuroanatomy – Orientation is Important

(A) Horizontal plane

(B) Coronal plane

(C) Sagittal plane
The Fundamental Unit of the Nervous System: the Neuron
Overview of Neuroanatomy
Overview of Neuroanatomy – Spinal Cord

MYELIN STAIN

white matter = black
grey matter = white

Spinal Nerve
Overview of Neuroanatomy – Brainstem

- medulla
- pons
- midbrain
- upper cervical cord

Brainstem

Spinal Cord
Overview of Neuroanatomy – Brainstem
Overview of Neuroanatomy – Thalamus
Overview of Neuroanatomy – Thalamus
Overview of Neuroanatomy – BRAINSTEM AND THALAMUS
Overview of Neuroanatomy – Axonal Highways
Overview of Neuroanatomy – Axonal Highways
Overview of Neuroanatomy – Internal Capsule
Overview of Neuroanatomy – Axonal Highways
Overview of Neuroanatomy – Corpus Callosum
Overview of Neuroanatomy – Cerebral Hemispheres

(A) Lateral view

Frontal lobe

Central sulcus

Parietal lobe

Sylvian fissure

Occipital lobe

Temporal lobe

cerebellum
Cortical Anatomy and Functional Organization

- Frontal Eye Fields
- Speech Production
- Speech Comprehension
- Visual Cortex
**Voluntary Motor Control: The Corticospinal Pathway**

- **Primary Motor Cortex**
- **Cell Body of UMN**
- **Axon of UMN**
- **Cell Body of LMN**
- **Synapse of LMN**
- **Target Muscle**
- **Target Muscle**
- **Axon of LMN**

- **Leg**
- **Arm**
- **Face**
Voluntary Motor Control: The Corticospinal Pathway

Primary Motor Cortex

Cell Body of UMN

Axon of UMN

Cell Body of LMN

Axon of LMN

Target Muscle

Synapse of LMN

Muscle

internal capsule

thalami

midbrain

pons

medulla

cervical spinal cord
Voluntary Motor Control: The Corticospinal Pathway

Primary Motor Cortex

Cell Body of UMN

Axon of UMN

Cell Body of LMN

Axon of LMN

Synapse of LMN

Target Muscle

internal capsule

thalami

midbrain

pons

medulla

cervical spinal cord

Motor Cortex

Corticospinal Tract

L

A

F

Crossing of tract to contralateral side
Voluntary Motor Control: The Corticospinal Pathway

Motor Cortex

Anterior

Posterior

(A) Horizontal plane

internal capsule

thalami

midbrain

pons

medulla

L

A

F

cervical spinal cord
Voluntary Motor Control: The Corticospinal Pathway
Voluntary Motor Control: The Corticospinal Pathway

- Motor Cortex
- Thalami
- Midbrain
- Pons
- Medulla
- Cervical spinal cord
- Internal capsule

Anterior and posterior views of the brain and spinal cord.
Voluntary Motor Control: The Corticospinal Pathway

- Ventral Surface
- Cervical spinal cord
- Thalami
- Midbrain
- Pons
- Medulla
- Internal capsule
- Motor Cortex
- L
- A
- F
- Cervical spinal cord
Voluntary Motor Control: The Corticospinal Pathway

Motor Cortex

internal capsule

thalami

midbrain

pons

medulla

cervical spinal cord
Vascular Supply to the Brain
Cerebrovascular Anatomy
Cerebrovascular Anatomy
Cerebrovascular Anatomy
Cerebrovascular Anatomy
Cerebrovascular Anatomy
Vascular Neurology: Neuroanatomy and Vascular Anatomy

Diagram showing the brain with labeled areas:
- Primary motor cortex
- Central sulcus
- Primary somatosensory cortex
- Parietal lobe
- Occipital lobe
- Primary visual cortex
- Speech Production
- Speech Comprehension

Key areas:
- Superior
- Anterior
- Posterior
- Inferior
- Frontal lobe
- Temporal lobe

Arteries:
- Anterior cerebral artery
- Middle cerebral artery
- Posterior cerebral artery

Labeled vessels:
- MCA superior division (cortical branches)
- MCA insular and opercular branches
- Sylvian fissure
- Middle cerebral artery (MCA)

Labels for speech areas:
- Speech production
- Speech comprehension
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- **thalami**
- **midbrain**
- **pons**
- **medulla**
- **cervical spinal cord**

**Motor Cortex**
Cortical Anatomy and Functional Organization

- **MOTOR**
  - FACE
  - ARM
  - LEG

- **SENSORY**

**Speech Production**

**Auditory Cortex**

**Speech Comprehension**