



Cerebral White Matter – High Yield Summary

Definition:

Cerebral white matter consists of myelinated nerve fibers that connect different parts of the brain.

Types of Cerebral White Matter Fibers:

1. Association Fibers:

Connect cortical areas within the same cerebral hemisphere.

Types:

- Short association fibers: connect adjacent gyri, U-shaped (arcuate fibers), lie just beneath the cortex.
- Long association fibers: connect distant gyri of different lobes.

Important Long Association Fibers:

- Uncinate fasciculus: connects orbital frontal gyri and motor speech areas with anterior temporal lobe.
- Superior longitudinal fasciculus: largest, connects frontal, parietal, occipital, and temporal lobes.
- Inferior longitudinal fasciculus: connects occipital lobe to temporal lobe.
- Cingulum: runs from anterior perforated substance through cingulate gyrus, isthmus, parahippocampal gyrus to uncus.

2. Commissural Fibers:

Connect corresponding cortical areas of both hemispheres and cross the midline.

Types:

- Corpus callosum
- Anterior commissure
- Posterior commissure
- Habenular commissure
- Hippocampal (fornix) commissure

Anterior Commissure:

Connects olfactory bulb, anterior perforated substance, uncus, and anterior parahippocampal gyrus.

Posterior Commissure:

Connects midbrain nuclei, superior colliculi, and pulvinar of thalamus.

Habenular Commissure:

Connects habenular nuclei of both sides of epithalamus.

Hippocampal Commissure:

Connects hippocampal formations of both sides via fornix crura.

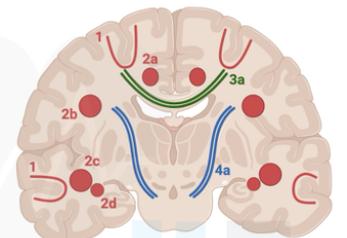
Corpus Callosum:

Largest commissural fiber bundle connecting nearly all symmetrical cortical areas of both hemispheres.

Parts of Corpus Callosum:

- Rostrum: thinnest part, connects orbital surfaces of frontal lobes.
- Genu: anterior curved part, fibers form forceps minor connecting frontal lobes.
- Body (Trunk): main part, connects parietal and temporal lobes, some fibers form tapetum.
- Splenium: posterior rounded part, fibers form forceps major connecting occipital lobes.

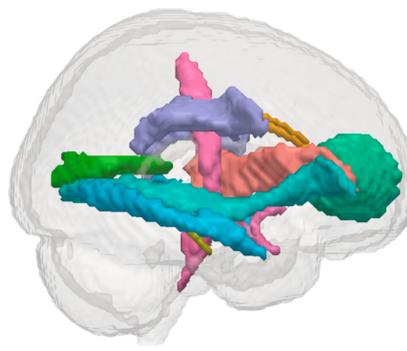
White Matter Tracts (Coronal Section)



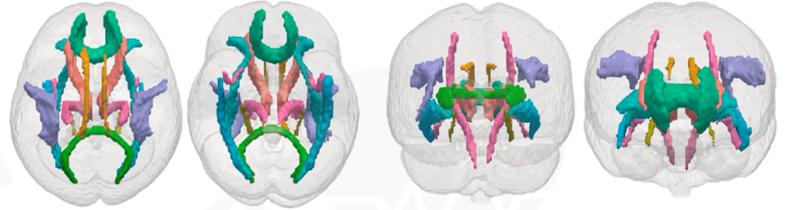
- 1) Short association fibers
- 2) Long association fibers
 - a) Cingulum
 - b) Superior longitudinal fasciculus
 - c) Inferior longitudinal fasciculus
 - d) Uncinate fasciculus
- 3) Commissural fibers
 - a) Corpus callosum
- 4) Projection fibers
 - a) Internal capsule

Exam Pearls:

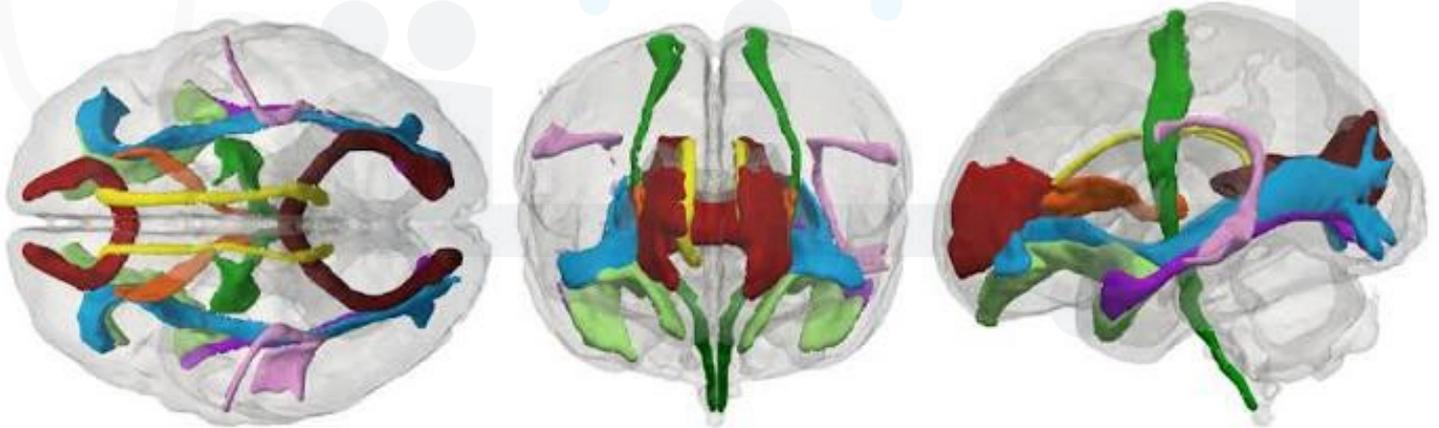
- Association fibers → same hemisphere.
- Commissural fibers → cross midline.
- Corpus callosum → largest commissure.
- Forceps minor → frontal lobes.
- Forceps major → occipital lobes.



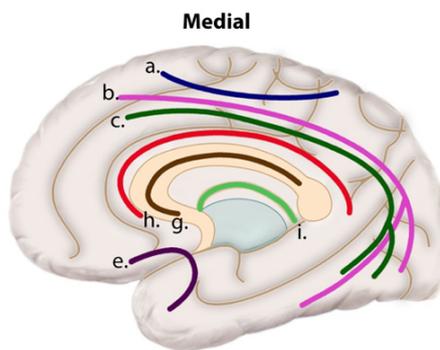
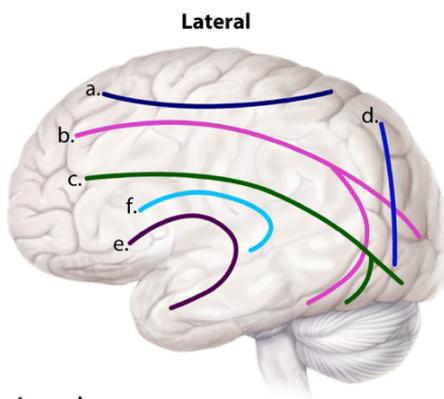
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| ■ Forceps Minor | ■ Corticospinal tract |
| ■ Anterior Thalamic Radiations | ■ Forceps Major |
| ■ Cingulate gyrus | ■ Uncinate Fasciculus |
| ■ Superior longitudinal Fasciculus | ■ Cingulum (hippocampus) |
| ■ Inferior longitudinal Fasciculus | ■ Inferior Fronto-Occipital Fasciculus |



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|---|--|--|
| ■ Corpus callosum genu (forceps minor) | ■ Inferior longitudinal fasciculus | ■ Uncinate fasciculus |
| ■ Corpus callosum splenium (forceps major) | ■ Inferior fronto-occipital fasciculus | ■ Cingulum cingulate gyrus |
| ■ Corticospinal tracts | ■ Arcuate fasciculus | ■ Anterior thalamic radiation |



Legend

- Superior occipito frontal fasciculus (royal blue)
- Superior longitudinal fasciculus (pink)
- Inferior longitudinal fasciculus (dark green)
- Perpendicular fasciculus (dark blue)
- Uncinate fasciculus (purple)
- Arcuate fasciculus (light blue) note two tracts
- Corpus callosum (brown)
- Cingulum (red)
- Fornix (light green)

Cerebral White Matter – High Yield Comparison Tables

Type	Function	Key Feature
Association fibers	Connect areas in same hemisphere	Do not cross midline
Commissural fibers	Connect both hemispheres	Cross midline
Projection fibers	Connect cortex with lower centers	Ascending or descending

Association Fibers	Description
Short	Adjacent gyri, U-shaped (arcuate)
Long	Distant gyri of different lobes

Long Association Fiber	Course	Connections
Uncinate fasciculus	Frontal → Temporal	Frontal orbital ↔ anterior temporal
Superior longitudinal fasciculus	Frontal → Occipital → Temporal	Frontal, parietal, occipital, temporal
Inferior longitudinal fasciculus	Occipital → Temporal	Visual ↔ temporal cortex
Cingulum	Ant. perforated substance → Uncus	Limbic lobe structures

Commissure	Main Function
Corpus callosum	Main cortical commissure
Anterior commissure	Olfactory connections
Posterior commissure	Midbrain & visual reflexes
Habenular commissure	Epithalamic nuclei
Hippocampal commissure	Connects hippocampi

Corpus Callosum Part	Shape / Position	Connections
Rostrum	Thinnest anterior part	Orbital frontal lobes
Genu	Curved anterior end	Frontal lobes (forceps minor)
Body	Main central part	Parietal & temporal lobes
Splenium	Posterior rounded end	Occipital lobes (forceps major)

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