What are White Matter Tract Pathways?

Worksheet

White matter tracts are neural highways - grouped myelinated fibres carrying signals between brain regions. Key tracts include commissural (corpus callosum), association (within hemisphere), and projection (cortex subcortex) tracts.

Questions

1. What separates the corpus callosum into anterior and posterior regions?

A) The central sulcus
B) The lateral ventricle
C) The falx cerebri
D) The body transitions to the splenium

2. A patient has a left middle cerebral artery stroke affecting the superior longitudinal fasciculus. Which language deficit is likely?

A) Wernicke's aphasia (fluent but nonsensical)
B) Broca's aphasia (non-fluent, effortful)
C) Conduction aphasia (impaired repetition)
D) Global aphasia (all language functions)

3. Which white matter tract carries motor signals from motor cortex to the spinal cord?

A) Corpus callosum
B) Corticospinal tract
C) Medial lemniscus
D) Spinothalamic tract

4. A patient with a thalamic stroke loses sensation (pain, temperature) on the contralateral body. Which ascending tract is affected?

A) Medial lemniscus (fine touch, proprioception)
B) Spinothalamic tract (pain, temperature)
C) Corticospinal tract
D) Fasciculus cuneatus

5. A patient has a stroke in the genu of the internal capsule. What deficits occur?

6. Why does damage to Broca's area sometimes spare speech production if the arcuate fasciculus is intact elsewhere?

7. A patient has a lesion in the corpus callosum (anterior part). What symptom might occur?

8. Define: What is white matter in the brain?

9. Define: What is the largest white matter tract in the brain?

10. Define: What is the arcuate fasciculus and why is it clinically important?

Answer Key

1. D) The body transitions to the splenium - The corpus callosum has four named regions: rostrum, genu, body, and splenium (posteriormost). The genu and body form the anterior part, splenium the posterior.

2. C) Conduction aphasia (impaired repetition) - The arcuate fasciculus (part of SLF) connects Broca and Wernicke. Damage conduction aphasia: comprehension and production intact, but repetition impaired.

3. B) Corticospinal tract - The corticospinal tract descends from motor cortex, through the internal capsule, pyramids of medulla, crosses at the pyramid base (~90% cross), and innervates spinal cord motor neurons.

4. B) Spinothalamic tract (pain, temperature) - Pain and temperature ascend via the spinothalamic tract (decussates in spinal cord), reaching the thalamus (VPL nucleus). Thalamic lesion contralateral pain/temperature loss.

5. Genu of internal capsule contains corticobulbar fibres (facial motor, speech): - Facial weakness (especially lower face) - Dysarthria (speech slurring) - If large stroke, also arm/leg weakness (adjacent motor fibres in posterior limb) - Contralateral deficits (fibre crossing in brainstem)

6. Arcuate fasciculus connects Broca (motor speech) to Wernicke (speech comprehension): - Damage to Broca area expressive (non-fluent) aphasia - If arcuate fasciculus intact below Broca some compensation via alternate routes - MRI diffusion tensor imaging (DTI) shows tract integrity

7. Corpus callosum anterior genu transfers information between frontal lobes: - Left hand cannot respond to commands given to right ear (only heard by right hemisphere) - Interhemispheric disconnection syndrome - Right hemisphere sees command but left hemisphere (speech) cannot access it - Classic split-brain phenomenon

8. Myelinated axons (nerve fibres wrapped in insulating myelin). Appears white because of myelin lipid content. Contrasts with grey matter (neuronal cell bodies).

9. The corpus callosum (CC), which contains ~200 million axons connecting the two cerebral hemispheres. Allows interhemispheric communication.

10. A curved white matter tract connecting Broca's area (speech production) to Wernicke's area (speech comprehension). Damage causes conduction aphasia (intact comprehension and production, but impaired repetition).