

Functional Notes on the Periventricular Structures of the CNS

FIBER TRACTS

Fornix: Axons of hippocampal neurons that project along midline of CNS to synapse on mammillary bodies of hypothalamus. The fornix is a component of the limbic system, linking the hippocampus with the hypothalamus.

Internal capsule: The internal capsule consists of axon fibers, including those ascending through CNS to synapse on neurons in primary sensory cortex AND those descending from motor cortex to synapse on cranial nerve nuclei in the brainstem (corticobulbar fibers) and on motoneuron pools in the spinal cord (corticospinal fibers). Other cortical areas also project to and from subcortical structures through the internal capsule. As the internal capsule passes through the subcortical structures, it separates the caudate from the putamen, and the globus pallidus from the thalamus.

BASAL NUCLEI (basal ganglia)

All three basal nuclei have similar functions in mediating directed motor movements as well as emotional control, cognition and eye movements.

Caudate: The caudate nucleus is C-shaped, with a large head and body that bulges into the lateral ventricles, and a tail that sweeps into the temporal lobe. The caudate is embryologically and histologically related to the putamen. Together, the caudate and putamen is termed the striatum.

Putamen: The putamen is a large nucleus that forms the lateral portion of the basal ganglia. Anteriorly and ventrally, it fuses with the caudate to form the *nucleus accumbens*, a component of the brain's reward system. Together, the putamen and the globus pallidus are referred to as the lentiform nucleus.

Globus pallidus: The globus pallidus lies medially to the putamen and is separated from the thalamus by the fibers of the internal capsule.

OTHER

Thalamus: The thalamus is a bilateral medially located subcortical structure that forms the lateral walls of the third ventricle. Its primary role is in receiving and filtering sensory and motor information and relaying them to other components of the CNS. It also functions in consciousness, alertness and sleep.

Hippocampus: The hippocampus is a bilateral structure that forms the medial wall of the temporal horn of the lateral ventricle and projects outputs via the fornix. Its primary physiological role is in learning and the formation of memories as well as spatial navigation. The hippocampus also regulates the CNS stress response.

Hypothalamus: The hypothalamus is another bilateral medially located subcortical structure and located inferior to the thalamus. Its role is in maintaining physiological homeostasis and controlling autonomic, neuroendocrine, limbic and other circuits.

Amygdaloid body (amygdala): The amygdala is an almond-shaped subcortical structure located bilaterally just anterior to the hippocampus. Its role is in processing emotions, particularly fear and anxiety in response to potential threats.