Cingulum bundle

The cingulum bundle is a bundle of nerve fibers in the brain that runs along the cingulate gyrus, a structure in the cerebral cortex that is involved in various cognitive and emotional processes. The cingulum bundle connects different regions of the brain, including the prefrontal cortex, the parietal cortex, and the temporal cortex, as well as subcortical structures such as the amygdala and hippocampus.

The cingulum bundle has been implicated in a range of functions, including attention, memory, emotion regulation, and pain perception. Disruptions to the cingulum bundle have been observed in various neurological and psychiatric disorders, including depression, anxiety, schizophrenia, and chronic pain. As such, the cingulum bundle is an important area of research in neuroscience and clinical psychology.

The dichotomy of the cingulum bundle into the dorsal supracallosal and ventral parahippocampal parts is widely accepted; however, the retrosplenial component with its multiple alternative connections has not been revealed.

This study aimed to delineate the microsurgical anatomy of a connectional transition zone, the isthmic cingulum, in relation to the posteromedial interhemispheric access to the atrium and discuss the relevant patterns of glioma invasion based on its fiber connections. White matter (WM) fibers were dissected layer by layer in a medial-to-lateral, lateral-to-medial, and posterior-to-anterior fashion. All related tracts and their connections were generated using deterministic tractography. The magnetic resonance imaging (MRI) tractography findings were correlated with those of fiber dissection. A medial parieto-occipital approach to reach the atrium was performed with special emphasis on the cingulate isthmus and underlying WM connections. The isthmic cingulum, introduced as a retrosplenial connectional crossroad for the first time, displayed multiple connections to the splenium and the superior thalamic radiations. Another new finding was the demonstration of lateral hemispheric extension of the isthmic cingulum fibers through the base of the posterior part of the precuneus at the base of the parieto-occipital sulcus. The laterally crossing cingulum fibers were interconnected with three distinct association tracts: the middle longitudinal (MdLF), the inferior frontooccipital fasciculi (IFOF), and the claustro-cortical fibers (CCF). In the process of entry to the atrium during posterior interhemispheric approaches, the splenial and thalamic connections, as well as the laterally crossing fibers of the isthmic cingulum, were all in jeopardy. The connectional anatomy of the retrosplenial area is much more complicated than previously known. The isthmic cingulum connections may explain the concept of interhemispheric and medial to lateral cerebral hemisphere invasion patterns in medial parieto-occipital and posteromesial temporal gliomas. The isthmic cingulum is of key importance in posteromedial interhemispheric approaches to both: the atrium and the posterior mesial temporal lobe [1)]

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Saygi T, Avyasov R, Barut O, Daglar Z, Baran O, Hasimoglu O, Altinkaya A, Tanriover N. Microsurgical anatomy of the isthmic cingulum: a new white matter crossroad and neurosurgical implications in the posteromedial interhemispheric approaches and the glioma invasion patterns. Neurosurg Rev. 2023 Mar 31;46(1):82. doi: 10.1007/s10143-023-01982-w. PMID: 37002437.