

Parallel seminar #2

Basal ganglia in controlling motor function; implications in movement disorders and DBS

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The purpose of Deep Brain Stimulation (DBS) is to modulate the activity of specific anatomical areas in the brain and thereby manage the symptoms of neurological and/or psychiatric disorders. Essential to this surgical management is an understanding of the anatomy and physiology of the target regions. The basal ganglia and the thalamus are the main areas for DBS. These structures are connected to higher (cortical) and lower (brainstem) areas through both partially parallel and partly integrated projections. These projections are primarily responsible for motor control, as well as other functions such as motor learning, associative functions, and emotions. According to the classical basal ganglia model, information flows through the basal ganglia back to the cortex through two pathways, while new models show parallel circuits subserve the classical functions of the basal ganglia engaging associative and limbic territories. The current targets of DBS for movement disorders are the dorsolateral part of the subthalamic nucleus, the posterior ventrolateral part of the internal globus pallidus, and the ventrolateral nuclei of the thalamus.

Understanding the anatomy and physiology of basal ganglia disorders is a growing field of modern medicine. Neurosurgical management of these disorders is by definition an anatomically based attempt. Main targets for current indications of DBS are located in the basal ganglia and thalamus. These targets all play a strategic role in the cortico-basal ganglia-thalamocortical motor, associative, and limbic circuits. A better understanding of the essence and extent of network alterations in local and remote neural elements following the application of electrical current will clarify the main components driving the therapeutic benefit, and the mechanisms that facilitate and that work at cross-purposes in patients.

In this seminar, we aim to elaborate on:

- Pathophysiology and pathoanatomy of the basal ganglia in PD
- Anatomical basis behind motor and non-motor symptoms in PD
- Anatomical considerations with regard to targeting of the basal ganglia with DBS electrodes