Cortical control of monkey subthalamic nucleus

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Abstract:

The subthalamic nucleus (STN) neuronal activity is modulated in relation to voluntary limb movements, and its abnormal activity has been reported in movement disorders, such as Parkinson's disease (PD). The manipulation of STN activity by deep brain stimulation or surgical lesion is an effective treatment for PD symptoms. The STN receives inputs from the cerebral cortices through the cortico-STN *hyperdirect* and cortico-striato-external pallido (GPe)-STN *indirect* pathways of the basal ganglia. However, the control mechanism of STN activity by cortical inputs is still not clear. To address this issue, we recorded activity of STN neurons in awake monkeys (*Macaca fuscata*) in combination with blockade of neurotransmission by local drug injections. Stimulation of motor cortices induced early and following late excitations in STN neurons. The pharmacological blockade showed that cortically induced early and late excitations in STN neurons are mediated by the *hyperdirect* and *indirect* pathways, respectively. Next, we recorded STN neuronal activity during the performance of Go/Stop/NoGo reaching task at three different targets. The results showed that the motor region in the STN is involved in both motor execution and cancellation. Task-related STN activity was also controlled through the *hyperdirect* cortico-STN glutamatergic and *indirect* GPe-STN GABAergic inputs.

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Please register beforehand →

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