Abstract: Basal ganglia lie between the cerebral cortex and the thalamus, and have dense fiber connections between them. These connections form 4-5 distinct loops or circuits to allow parallel processing of information. Among them, the most intensively studied is the motor loop, which comprises 2 distinct direct and indirect pathways. The direct pathway disinhibits the powerful inhibition of the internal segment of the globus pallidus/substantia nigra pars reticulata upon thalamic ventrolateral nuclei with a net result of facilitatory influence upon the motor cortex. By contrast, the indirect pathway exerts an inhibitory effect. Overall this dual system provides a center (excitatory)-surround (inhibitory) mechanism to focus its effect on selected cortical neurons. Although putative transmitters, inhibitory or excitatory nature of these projections and their receptors are mostly known, the functional role of the loop in motor control is not precisely understood. Several lines of evidence have recently been presented to support the view that this center-surround mechanism is used to focus the output to a specific group of muscles required for performing a specific task. This operation is made possible through opening the sensory channel for the expected sensory feed-back afferents during movement. Thus one of the important functions of basal ganglia seems to be the gating of sensory input for motor control. J. Med. Invest. 48: 142-146, 2001.

Keywords: Basal ganglia, Parkinson's disease, dystonia, sensory-motor integration, muscle afferent block
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A Normal

B Parkinsonism

C Hemiballismus

D Oystonia

Thalamo-cortical Projection

Globus Pallidus

Putamen

Excitation
Inhibition

The images illustrate the neural pathways and projections in normal and pathological conditions. The diagrams show the connections between the cortex, thalamus, and basal ganglia, highlighting the disruptions in Parkinsonism, hemiballismus, and dystonia.

The text provides context for the images, explaining the neural mechanisms involved in these conditions and the role of basal ganglia in motor control.

For example, in Parkinsonism, the direct pathway is impaired, leading to bradykinesia. In hemiballismus, the indirect pathway is disrupted, resulting in akinesia paradoxale. Dystonia involves abnormalities in both the direct and indirect pathways, leading to increased muscle stiffness and involuntary movements.
Hemiballism

Hemiballism is a condition characterized by involuntary, rhythmic, uncontrolled movements of one side of the body, usually the face and arm, that occur during voluntary movement. Hemiballism is often associated with lesions in the basal ganglia, particularly in the thalamus and the putamen. The exact mechanism of hemiballism is not fully understood, but it is thought to involve abnormal firing of neurons in the basal ganglia, leading to inappropriate and uncoordinated movements. Hemiballism can be pharmacologically treated with dopamine receptor agonists, which can reduce the frequency and severity of the movements.

Dystonia

Dystonia is a movement disorder characterized by involuntary, sustained, and often abnormal muscle contractions that cause sustained or repetitive movements or postures. Dystonia can affect any part of the body, but it commonly affects the limbs, neck, and trunk. The symptoms of dystonia can range from mild, occasional twitching to severe, disabling movements. Dystonia can be caused by genetic mutations, brain injury, or certain medications. The treatment of dystonia can include pharmacological agents, such as dopamine receptor agonists and benzodiazepines, as well as surgical interventions.

Sensory trick

A sensory trick is a method used to modulate movement in patients with dystonia. Sensory tricks can be used to improve or worsen the symptoms of dystonia. In Parkinson's disease, sensory tricks can be used to improve movement by altering the sensory input to the brain. In dystonia, sensory tricks can be used to worsen movement by altering the sensory input to the brain. Sensory tricks can be used to improve or worsen the symptoms of dystonia by altering the sensory input to the brain. Sensory tricks can be used to improve or worsen the symptoms of dystonia by altering the sensory input to the brain. Sensory tricks can be used to improve or worsen the symptoms of dystonia by altering the sensory input to the brain. Sensory tricks can be used to improve or worsen the symptoms of dystonia by altering the sensory input to the brain.

R. Kaji. Sensory function of basal ganglia