

The connection between basal ganglia and cerebellum in human brain

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Our recent anatomical studies on direct connections between the cerebral cortex and medial pallidum nucleus, we observed the presence of interesting connections between this nucleus and the cerebellum, highlighting as these subcortical structures are part of a densely interconnected network. Through DTI method with Constrained Deconvolution System (CDS) techniques we evaluated these connections in ten healthy subjects and in three patients with Parkinson's syndrome. Our results demonstrate that the pathways linking the cerebellum to basal ganglia are topographically organized. Furthermore, the cerebellum not only provides output exclusively to the primary motor cortex via the thalamus for the motor control and coordination of movements but it is involved in the process of lock and un-lock of the motor gesture through the planning role of the basal ganglia. These pathways provide evidence for substantial communication between the cerebellum and the basal ganglia that is independent of the cerebral cortex. Communication between these major subcortical nuclei is likely to have important clinical implications. We discuss how the pathways linking the cerebellum with the basal ganglia may provide a useful framework for understanding cerebellar contributions to the manifestation of two prototypical basal ganglia disorders, Parkinson's disease and dystonia.

Key words

DT-MRI, cerebellum, basal ganglia.