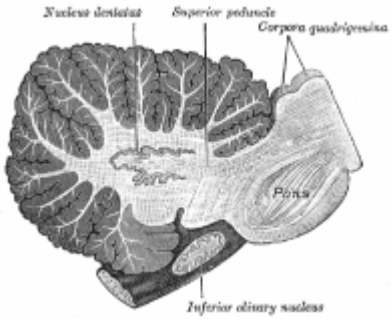
Dentate Nucleus (DN)



The dentate nucleus is a cluster of neurons, or nerve cells, in the central nervous system that has a dentate – tooth-like or serrated – edge. It is located within the deep white matter of each cerebellar hemisphere, and it is the largest single structure linking the cerebellum to the rest of the brain [1].

It is the largest and most lateral, or farthest from the midline, of the four pairs of deep cerebellar nuclei, the others being the fastigial nucleus and the globose and emboliform nuclei which together are referred to as the interposed nucleus. The dentate nucleus is responsible for the planning, initiation, and control of voluntary movements. The dorsal region of the dentate nucleus contains output channels involved in motor function, which is the movement of skeletal muscle, while the ventral region contains output channels involved in nonmotor function, such as conscious thought and visuospatial function.

The dentatorubrothalamic tract (DRTT) is the major efferent cerebellar pathway arising from the dentate nucleus (DN) and decussating to the contralateral red nucleus (RN) and thalamus. Surprisingly, hemispheric cerebellar output influences bilateral limb movements. In animals, uncrossed projections from the DN to the ipsilateral RN and thalamus may explain this phenomenon.

Frameless stereotactic targeting of the cerebellar dentate nuclei in NHPs for future investigational drug delivery is feasible, safe, and accurate [2].

The DN represents an important anatomical structure in surgical interventions involving the posterior fossa, particularly in the elderly due to the common occurrence of atrophy-related problems in this age group. Functionally and anatomically, the DN has close relations with the superior cerebellar peduncle and middle cerebellar peduncle. The inferior cerebellar peduncle poses positional risks, as it follows an anterior and superior course relative to the DN. [3].

1)
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2)
Wetzel JS, Hardcastle N, Tora MS, Federici T, Frey S, Novek J, Arulanandam T, Johnson M, Pielemeier R, Boulis NM. Frameless Stereotactic Targeting of the Cerebellar Dentate Nucleus in Nonhuman

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3) Akakin A, Peris-Celda M, Kilic T, Seker A, Gutierrez-Martin A, Rhoton A Jr. The Dentate Nucleus and its Projection System in the Human Cerebellum: A Microsurgical Anatomical Study Dentate Nucleus Microsurgical Anatomical Study. Neurosurgery. 2014 Jan 19. [Epub ahead of print] PubMed PMID: 24448179.