

Incerto collicular pathways

Posterior [subthalamic deep brain stimulation](#) (DBS) targeting the zona incerta (ZI) is an emerging treatment for tremor syndromes, including Parkinson's disease (PD) and essential tremor (ET).

Evidence from [animal](#) studies has indicated that the ZI may play a role in [saccadic eye movements](#) via pathways between the ZI and [superior colliculus](#) ([incerto collicular pathways](#)).

Posterior [subthalamic deep brain stimulation](#) (DBS) permitted testing this [hypothesis](#) in humans.

Sixteen patients (12 with PD and 4 with ET) underwent DBS using the MRI-directed implantable guide tube technique. Active electrode positions were confirmed at the caudal ZI. Eye movements were tested using direct current electrooculography (EOG) in the medicated state pre- and postoperatively on a horizontal predictive task subtending 30°. Postoperative assessments consisted of stimulation-off, constituting a microlesion (ML) condition, and high-frequency stimulation (HFS; frequency = 130 Hz) up to 3 V. RESULTS With PSA HFS, the first saccade amplitude was significantly reduced by 10.4% (95% CI 8.68%-12.2%) and 12.6% (95% CI 10.0%-15.9%) in the PD and ET groups, respectively. With HFS, peak velocity was reduced by 14.7% (95% CI 11.7%-17.6%) in the PD group and 27.7% (95% CI 23.7%-31.7%) in the ET group. HFS led to PD patients performing 21% (95% CI 16%-26%) and ET patients 31% (95% CI 19%-38%) more saccadic steps to reach the target.

PSA DBS in patients with PD and ET leads to hypometric, slowed saccades with an increase in the number of steps taken to reach the target. These effects contrast with the saccadometric findings observed with subthalamic nucleus DBS. Given the location of the active contacts, incerto-collicular pathways are likely responsible. Whether the acute finding of saccadic impairment persists with chronic PSA stimulation is unknown ¹⁾.

¹⁾

Bangash OK, Dissanayake AS, Knight S, Murray J, Thorburn M, Thani N, Bala A, Stell R, Lind CRP. Modulation of saccades in humans by electrical stimulation of the posterior subthalamic area. J Neurosurg. 2019 Mar 15;1-9. doi: 10.3171/2018.12.JNS18502. [Epub ahead of print] PubMed PMID: 30875687.

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