

Deep Brain Stimulation Effects on Cardioagal Responses in Patients with Parkinson's Disease

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Objective:

To evaluate the cardiovascular autonomic responses in Parkinson's disease (PD) patients with deep brain stimulation (DBS) at different targets.

Background:

The effects of DBS on autonomic functions in PD patients are not fully clear. Studies showed mixed results of the subthalamic nucleus (STN) DBS implantation on orthostatic hypotension. Similar studies on globus pallidus interna (GPI) DBS have not been reported. Whether the location of DBS on either target is nearby to the central autonomic nuclei and able to modify autonomic functions requires further investigation.

Design/Methods:

Twelve PD patients with bilateral STN DBS and four with GPI DBS were studied. While on the tilt-table, computerized real-time heart rate changes (RR intervals) were monitored during deep breathing (E/I ratio), Valsalva's maneuver (Valsalva's ratio), and head-up tilting (HUT; 30/15 ratio). Real time blood pressure (BP) is also measured during HUT. Measurements were performed with DBS turned off, repeated again 30 minutes after DBS was turned on.

Results:

Patients with Gpi DBS (n = 4)

	E/I Ratio	Valsalva's Ratio	30/15 Ratio	BP Changes on HUT (Systolic / diastolic)
DBS Off	1.07	1.40	1.05	-14.97 / +0.45 mmHg
DBS On	1.09	1.43	1.03	-7.55* / +4.48 mmHg

*p< 0.05, compared to their respective variables when DBS is off

Patients with STN DBS (n = 12)

	E/I Ratio	Valsalva's Ratio	30/15 Ratio	BP Changes on HUT (Systolic / diastolic)
DBS Off	1.19	1.39	1.12	-9.97 / -4.17 mmHg
DBS On	1.21	1.36	1.15	-10.70 / -1.89 mmHg

Conclusions:

- Data are presented as the mean values of each variables in their groups.
- There were no significant differences of orthostatic regulation with regards to DBS anatomical target locations, including RR intervals on deep breathing (E/I ratio), Valsalva's maneuver (Valsalva's ratio), and head-up tilting (HUT; 30/15 ratio).
- The systolic BP change on HUT was significantly decreased after GPI-DBS is turned on, but not on diastolic BP changes. There is no such phenomenon when STN-DBS is turned on.
- Our results suggest that GPI-DBS may have fewer side effects or even may benefit PD patients' autonomic cardiac functions compared to STN-DBS, although the differences between GPI and STN are very small.
- Further investigation with more subjects is indicated to confirm this finding. Our study is still ongoing.