Use of Functional MRI to assess effects of Deep Brain Stimulation frequency changes on brain activation in Parkinson Disease

**Study Population**

Parkinson disease patients who had been implanted with deep brain stimulation in the subthalamic nucleus (STN) were enrolled in this study.

<table>
<thead>
<tr>
<th>Sample Size</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females, Males</td>
<td>2,12</td>
</tr>
<tr>
<td>Mean age (range)</td>
<td>64 (55-72)</td>
</tr>
<tr>
<td>Stimulation</td>
<td></td>
</tr>
<tr>
<td>Bilateral STN</td>
<td>7</td>
</tr>
<tr>
<td>Left STN</td>
<td>5</td>
</tr>
<tr>
<td>Right STN</td>
<td>2</td>
</tr>
</tbody>
</table>

**Study Paradigm**

1. DBS cycling 30 seconds ON/OFF
2. Scan subjects at optimal settings
3. Alter frequency
4. Scan subjects at the new frequency
5. Repeat steps 3. and 4. as time allows
6. Subjects sent home on clinical optimal settings

**Outcomes**

Thalamic (red) and globus pallidum externa (blue) activation was present in the group cohort.

When frequency was decreased by 30 and 60Hz, activation levels decreased in the thalamus ($P < .001$, $P = .03$ respectively) and the globus pallidum externa ($P < .001$, $P = .04$ respectively).

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Reproduced from Marisa DiMarzio, PhD, Radhika Madhavan, PhD, Ileana Hancu, PhD, Eric Fiveland, MS, Julia Prusik, MPH, Suresh Joel, PhD, Michael Gillogly, BA/BS, RN, Ilknur Telkes, PhD, Michael D Staudt, MD, MSc, Jennifer Durphy, MD, Damian Shin, PhD, Julie G Pilisis, MD, PhD. Use of Functional MRI to Assess Effects of Deep Brain Stimulation Frequency Changes on Brain Activation in Parkinson Disease, *Neurosurgery*, Volume 88, Issue 2, February 2021, Pages 356–365, https://doi.org/10.1093/neuros/nyaa397 with permission from the Congress of Neurological Surgeons.