

Field H1 of Forel vs Subthalamic Nucleus Electrical Stimulation in Parkinson's Disease: Long-Term Effects on Motor Symptoms and Quality of Life

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Fabio Luiz Francheschi Godinho, Ricardo Iglesias, Kaito Laube, Juliana Rodrigues.
University of São Paulo. Brasil

Autor para correspondencia: Juliana Rodrigues. Correo electrónico: juliana.passinho@hotmail.com

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Abstract

Introduction: Deep brain stimulation (DBS) of the subthalamic nucleus (STN) relieves motor symptoms, including levodopa-responsive gait disorders in Parkinson's disease (PD). Traditionally, STN-DBS is not indicated to treat severe, clinically resistant axial symptoms. In this scenario, field H1 of Forel (FF) stimulation (FF-DBS) is likely a feasible option, given it improves motor symptoms, including freezing of gait (FOG), as shown by a short-term study. However, no data are available about the long-term effects of this therapy. Finally, no study has compared the long-term effects of FF and STN-DBS.

Method: We analyzed 22 patients (10 FF-DBS, 12 STN-DBS). Motor symptoms (MDS-UPDRS III), gait (FOG score), cognition (Mattis DRS), quality of life (PDQ-39), and levodopa equivalent daily dose were assessed. Outcomes between FF-DBS and STN-DBS were compared.

Results: The mean follow-up was 6.18 years (95% CI: 5.57–6.78). Compared with the preoperative period, patients with FF had an average reduction of 32.2% in the MDS-UPDRS III scores ($p < 0.01$), a decrease of 35.3% in the FOG scores ($p < 0.01$), and an improvement of 25.9% in the PDQ-39 ($p < 0.01$). There was a 7.5% decrease in cognition ($p < 0.01$). Levodopa equivalent dose (LED) was reduced by 26.3% ($p < 0.01$). The STN group had an average reduction of 39.4% in the MDS-UPDRS III scores ($p < 0.01$), a decrease of 23.7% in the FOG scores ($p < 0.01$), and an improvement of 33.2% in the PDQ-39 scores ($p < 0.01$). Cognition decreased by 1.6% ($p < 0.01$) and LED by 15.06% ($p = 0.02$). Patients with FF-DBS were older than those with STN-DBS at the time of surgery: 61.2 years and 55.7 years, respectively ($p = 0.02$), and had longer duration of disease ($p = 0.02$). Patients with FF-DBS had a greater reduction in FOG ($p = 0.02$) than did

the STN group and presented with a greater decrease in cognition ($p < 0.01$) after five years. STN-DBS had a greater effect on quality of life.

Discussion: Both FF-DBS and STN-DBS produced long-term motor improvements and enhanced quality of life in Parkinson's patients. While general motor benefits were similar, FF-DBS showed greater improvement in axial symptoms and FOG, but with a higher cognitive decline. FF-DBS also required lower energy, suggesting a potential economic advantage. Patient selection was key, with FF-DBS typically applied in more advanced cases. These findings support FF-DBS as an effective alternative for axial symptoms, but further randomized studies are needed.

Conclusions: Both FF-DBS and STN-DBS relieved motor symptoms and improved quality of life over a long-term period. Patients with FF-DBS had a higher reduction in both FOG and in LED than did those with STN-DBS. These data support our hypothesis that FF-DBS is a safe and efficient option for treating motor symptoms in PD, including FOG in advanced stages

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