

Long-term effects of bilateral STN-DBS on speech in Parkinson's disease patients

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Introduction: Speech alterations are very common and disabling in Parkinson's disease (PD) patients. However, mixed results have been reported regarding the effects of bilateral Subthalamic Nucleus Deep Brain Stimulation (STN-DBS) on speech.

Objective: To evaluate the long-term effects of bilateral STN-DBS on speech in a cohort of advanced PD patients.

Methods: This observational study included 25 consecutive advanced PD patients treated with bilateral STN-DBS. Demographic, neuroimaging, and clinical variables were collected. Each patient underwent a neurological evaluation (performed using UPDRS part III score and subscores) and a perceptual-acoustic analysis of speech in OFF- and ON-therapy conditions before surgery. All patients have been reevaluated in the long-term in different stimulation and drug conditions (on-stimulation/off-medication; off-stimulation/off-medication; on-stimulation/on-medication). The primary outcome was the percentage change of speech intelligibility obtained by comparing postoperative on-stimulation/off-medication condition with preoperative off-medication condition. Based on the presence/absence of postoperative worsening of speech intelligibility, patients were divided into two groups ("stable" vs "worsened") that were compared to find significant differences in demographic, clinical and speech variables.

Results: 25 PD patients treated with bilateral STN-DBS with a mean five-year follow-up were included. In the long-term, speech intelligibility did not worsen if compared with preoperative values. STN-DBS led to a significant improvement of speech intelligibility ($p < 0.005$) in the postoperative assessment by comparing the on-stimulation/off-medication and off-stimulation/off-medication conditions. Patients included in the "worsened" subgroup ($n=9$) showed: greater PD motor severity before surgery; postoperative worse speech intelligibility, higher shimmer of sustained phonation and lower intensity of both spontaneous speech and sustained phonation.

Conclusions: Our results highlight the possible long-term beneficial effects of bilateral STN-DBS on speech intelligibility in advanced PD patients. The identification of PD clinical characteristics associated with long-term worsening of speech after surgery may allow to improve the prognostic accuracy and to employ early speech interventions.