

The Impact of STN-DBS on Speech Production in PD: A Fiber-Tract Analysis
M. McHenry, A. Fenoy, S. Villareal

Deep brain stimulation of the subthalamic nucleus (STN-DBS) has documented effects on voice, articulation, fluency, and intelligibility, but these effects are not consistent across individuals or tasks. This study was designed to determine how specific fiber pathways may be implicated in the speech changes post-STN DBS, specific to PD phenotype. Reading and spontaneous speech samples were obtained from 30 individuals with Parkinson's Disease (PD). Seventeen were tremor dominant, and thirteen were akinetic rigid dominant. Fiber tract analysis was conducted by merging pre-operative 3T DTI MRI with post-operative CT of electrode locations. Although fundamental frequency increased in both groups in the ON condition, the underlying voice type of breathy vs tight did not change. In most individuals, the supplemental motor area and primary motor area were involved via the dentate-rubro-thalamic tract (DRT). The majority of individuals in both the akinetic rigid and tremor dominant groups demonstrated involvement of the DRT. Greater medial STN contact led to more DRT involvement. In the tremor dominant individuals, larger voltage led to more DRT involvement. Regardless of phenotype, overall speech production was typically improved in the DBS-On condition, with faster words per minute reflecting faster articulation rate and better cognitive linguistic processing. Nonetheless, individual differences were evident in both groups, with the primary impact of DBS-On varying across voice, rate, fluency, articulation, and cognitive-linguistic function.