Effects of Deep Brain Stimulation on Impulsivity in Parkinson Disease Patients

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Introduction:
Common ICDs include pathological gambling, compulsive buying, hypersexuality, medication misuse, binge eating and punding. These disorders are often very self-destructive to patients and their families and thus can be very disruptive to the individual’s overall well-being. How decision making in PD leads to ICDs has not been well defined. ICDs are more common in patients treated with dopamine agonists (DAs) in comparison to other medical therapies. A recent study suggests that ICDs are reduced after DBS2. Whether this improvement is due to the reduction in DAs that DBS allows for or whether acute stimulation also has a direct effect on the reward pathways has not been established. Using a battery of validated questionnaires and impulsivity behavioral tasks, we examine which aspects of impulsivity are altered—attention, motor perseverance, and lack of planning. We examine the effect of acute stimulation on impulsive reward and choice.

Methods:
- Two groups of patients were evaluated. One cohort has been selected for DBS but not yet undergone the procedure. As the study continues, these patients will be followed longitudinally. The other are patients that have had previous DBS 1-8 years ago. All patients will be in a medication “ON” state, meaning the patient has taken their medication as scheduled. The last dose of medication was recorded. Demographic and medical variables were also recorded.
- All patients complete an unstructured interview with treating physician assessing common ICDs (Criteria from DSM IV), the Barratt impulsiveness scale 11 (BIS 11) and the questionnaire for impulsive control disorders in Parkinsons disease - Rating scale (QUIP-RS). These tests have been validated and are the most commonly used measures of ICDs.
- Impulsive action and choice is assessed using the Go / No Go task (GNG) and the Balloon analogue risk task (BART). The GNG tests the patient’s ability to inhibit an inappropriate response. The BART assesses risk taking behavior. To examine the impact of acute stimulation on impulsive behavior, all subjects with DBS previously implanted performed behavioral tests in both the ON and OFF stimulation state.

Results:

Barratt Impulsiveness Scale

Pre and post surgical patients - all factors (attention, non planning and motor) were significantly different from normative data (P<0.001), n=5.

Go No go Task

Bart and Go/No go were performed in the ON and OFF stimulation state. Of note, 4 of 5 patients had more misses OFF than ON. No significance was found. (n=5)

Conclusion:
The incidence of ICDs in our cohort appears significantly higher than those reported previously. We predict that DBS will lessen ICDs in our cohort by improving attentional, motor, and non-planning factors leading to impulsivity. We suggest that in a large sample size DBS improves ICDs not only by allowing medication reduction, but also by independently affecting impulsive choice and reward systems.