Introduction: PD is characterized by a set of autonomic, cognitive, emotional, and pain symptoms. The effects of DBS on these non-motor symptoms are not well defined, and between 13-14% of PD patients have changes in impulsivity, when these changes are problematic they are termed ICDs. ICDs are characterized by an inability to control compulsive behaviors including medication hoarding, pathological gambling, binge eating, hypersexuality, compulsive shopping and punding. ICDs may be the result of dysfunctional sensorimotor gating. SMG in patients can be monitored by studying the ability of a pre-pulse to alter startle reflex. PPI attenuates the disruptive responses to the stimulus. PPI is impaired in PD patients as the pre-pulse is less effective in reducing the startle than in its control patients. ICDs in PD have been found to improve following deep brain stimulation, the question remains whether this change is due to stimulation itself and/or reduction in medication. We examine the effect that DBS itself has on PPI and believe PPI will improve in PD DBS patients.

Abstract: Deep brain stimulation (DBS) for Parkinson’s Disease (PD) targeting the subthalamic nucleus (STN) is a well-recognized treatment for selected patients. The effects of DBS on these non-motor symptoms are not as well defined, though there is mounting evidence that pain processing may improve following DBS. One means of testing this perception to external stimuli is by assessing prepulse inhibition (PPI); PPI is the attenuation of a normal startle reflex when a sudden intense startling stimulus is preceded by a weaker and non-startling sensory stimulus. The effect of DBS on PPI has not been defined, though it has been demonstrated that the latency of the startle response is reduced in PD as compared to controls and that this latency becomes more normal with STN DBS. We examine how DBS affects PPI, by testing patients undergoing DBS surgery preoperatively, intraoperatively and postoperatively. Impulse Control Disorders have been reported to be reduced in PD patients following DBS treatment and alteration of PPI may be the means by which DBS reduces ICDs.

Methods: Study includes adults selected for DBS surgery. Patients participating in this study will have idiopathic PD. They will receive the same preoperative, surgical and postoperative care as other patients would receive. Only patients with startle reflexes and adequate hearing will be included. Patients will experience white noise interrupted by loud bursts of noise through headphones. The testing itself involved acclimation to the background white noise followed by a habituation block where only startle pulse is presented for 6 trials in order to allow eye blink startle to stabilize. The 4 PPI test blocks will be presented in random order. EMG record start of the acoustic stimulus to 250 ms after last trial component is sampled.

Conclusions: We predict that PPI will improve in PD DBS patients even with minimal medication changes and suggest that this may be a result of modulation of local field potentials (LFPs) in the STN. The alteration of PPI may be the means by which DBS reduces ICDs and we suggest that in a larger sample size DBS will improve ICDs not only by allowing medication reduction, but also by independently affecting impulsive choice and reward systems.

Hypothesis: DBS itself has an effect and that PPI will improve in PD DBS patients even with minimal medication changes. We further suggest that this may be a result of modulation of local field potentials.

Results:

Figure 1: Schematic of STN and Gpi DBS

Figure 2: Blink Max amplitude graph depicting a reduction in average blink amplitude in patients when they are exposed to the prepulse+startle (PPI) in comparison to startle alone.

Figure 3: PPI trial EMG recording data for PD DBS patient. Amplitudes marked signifying time points during which startle, prepulse, or prepulse and startle pulse were administered.

Figure 4: Startle pulse were administered.

Figure 5: PPI trial EMG recording data for PD DBS patient. Amplitudes marked signifying time points during which startle, prepulse, or prepulse and startle pulse were administered.