Threshold for Seizures During Cortical Stimulation Mapping

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METHODS: Two four-contact electrodes were chronically implanted over the dominant hand/arm region of primary motor cortex and connected to a subclavicular implantable generator that streams 4 channels of ECoG data in real-time (Resume II leads/Activa PC+5, Medtronic, Minneapolis, MN). Motor intent data were collected by instructing the subject to move/rest their dominant hand with random duration of each state. Decoding methods and adaptive parameter refitting methods were determined using cross-validation to select decoder architecture and hyper-parameters. A smart phone application was developed to allow the subject simplified control of the BCI. The BCI application was configured to run on a small battery powered PC mounted on the subject’s wheelchair.

RESULTS: Using the mobile application, the subject can set decoder sensitivity and initiate decoder recalibration independently. The BCI was designed to extend the control output beyond hand grasp for additional sensitivity and initiate decoder recalibration independently. The BCI was mounted on the subject’s wheelchair to avoid impairing patient mobility while using the BCI.

CONCLUSION: We demonstrate a successful implementation of a BCI for at-home use, driven by user feedback and ease-of-use. Our next steps will focus on long-term, at-home performance and user-guided improvements to expand the control output. Control could be expanded to smart-home functions or prosthetic devices. Future work will focus on long-term, at-home performance and user-guided refitting methods were determined using cross-validation to select decoder architecture and hyper-parameters. 

628 Threshold for Seizures During Cortical Stimulation Mapping
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INTRODUCTION: The goal of cortical stimulation mapping is to stimulate eloquent cortical areas with sufficient voltage to elicit functional responses (motor or sensory) while minimizing intra-operative seizures. However, there is significant variation in how patients respond to cortical electrical stimulation.

METHODS: We utilized an institutional dataset of 55 patients who underwent extra-operative functional mapping during pre-operative evaluation for epilepsy surgery. Stimulation protocol involved biphasic pulses at 50 Hz, 0.5 ms pulse width, and 2–3 second train. Intensity started at 1.5 mA and was increased by 1 mA (maximum of 14.5 mA) until behavioral change (motor/sensory) or electrical afterdischarge (AD) was observed. SPSS v.26 software was utilized for the analyses. Statistical correlations and comparisons were tested for significance (p < 0.05) using Spearman’s Rho correlation, Friedman’s two-way ANOVA, and Mann-Whitney U Test.

RESULTS: The rate of stimulation-induced seizures, confirmed per video EEG, was 14.5% (n = 8). Of these, 5 involved generalized limb/trunk movements. All seizures were consistent with patients’ typical seizure semiology and majority (7/8) were preceded by AD in adjacent cortex. On average, seizures occurred 40 (±39) minutes into mapping (range 5–120 minutes). In seizure patients (n = 8), the voltage threshold for functional responses (motor or sensory behaviors) was significantly lower (3.3 mA) than that of AD (7.9 mA) or seizure (7.3 mA) (P = .03). The threshold for functional and pathological mapping responses differed by average of ~ 5 mA (P = .005).

CONCLUSION: Functional responses during mapping occur on average ~5 mA lower voltage thresholds than pathological responses (AD or seizure). History of tonic-clonic seizures, AD occurrence, and prolonged mapping may increase risk for cortical mapping seizures.

629 Predictive Trajectory Analysis of Co-Morbid Depression and Anxiety in Patients With Medically-Refractory Obsessive-Compulsive Disorder After Gamma Knife Ventral Capsulotomy
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INTRODUCTION: Gamma Knife Ventral Capsulotomy (GKVC), an ablative procedure targeting the ventral, anterior internal capsule, can effectively treat severe, medically-refractory Obsessive-Compulsive Disorder (OCD). Our team has shown that predictive analysis can determine rate of improvement in OCD severity after GKVC. Co-morbid generalized anxiety and depression are common in this population and have been shown to improve after GKVC, though the trajectory of improvement is unknown.

METHODS: We examined a prospective cohort of OCD patients treated with GKVC (n = 55) at our institution. We assessed co-morbid depression and anxiety severity using the Hamilton Depression Rating Scale (HAM-D) and Hamilton Anxiety Rating Scale (HAM-A), respectively. Measures were collected at 6, 12, 24, 36, 48, and 60 months. We developed parametric and piecewise linear models to fit the prospective data and determined the best fit model for HAM-A and HAM-D using sample-size adjusted Bayesian Information Criterion.

RESULTS: For both HAM-D and HAM-A, a parametric model with two classes and a zero class best fit the data. For depression, 9% of individuals with the lowest HAM-D scores can expect no change from baseline, 47% exhibit slight reduction in depression severity (11.1% in year 1; 5.5% by year 5), and 44% with the highest baseline scores can expect significant and continued reduction in depression severity (19.0% in year 1; 53.0% by year 5) after GKVC. For general anxiety severity, 51% of the population can expect zero change in HAM-A scores, 44% a slight decrease (12.7% in year 1; 34.3% by year 5), and 5% can expect significant, continued reduction (28.2% in year 1; 55.9% by year 5).

CONCLUSION: Co-morbid depression and general anxiety severity may exhibit continued trajectories of improvement for some patients 5 years after GKVC.

630 Outcomes of a Prospective, Multicenter, International Registry of Deep Brain Stimulation for Parkinson’s Disease
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INTRODUCTION: The effectiveness of Deep Brain Stimulation (DBS) for reducing motor complications of Parkinson’s disease (PD)