Deep TMS for Obsessional Thinking: ACC Deregulation and Genomics as Possible Outcome Markers
Matthew Graller M.A., Laura Viner Ph.D., Jesse Viner M.D.
Yellowbrick Center for Clinical Neuroscience

Objectives
The purpose was twofold: 1) to examine whether TMS targeting the anterior cingulate cortex is beneficial in reducing severe obsessional thinking in complex patients and 2) to determine whether treatment response may be associated with a deregulated anterior cingulate cortex and/or certain genotypes.

Introduction
Evidence is accumulating in support of the use of TMS for the treatment of OCD (Berlim et al., 2013; Zangen, 2016). The anterior cingulate cortex (ACC) is the brain target of choice for OCD because it is central in the processing of negative emotions including fear and threat (Elkin, 2011; McGovern and Sheth, 2017), which is at the core of OCD symptoms. A TMS device that targets the ACC is a promising approach to this often treatment-resistant problem. At this point, it has not been established whether a deregulated ACC may, in actuality, be associated with more positive outcomes for TMS treatment targeting the ACC.

Method
A sample of 8 patients, 4 male and 4 female, aged 19-31, participated in the study. All 8 patients had severe obsessional thinking as determined independently by three senior psychiatrists. Baseline YBOCS, qEEG, and genomic analysis from Genomind were obtained at admission to treatment in an intensive outpatient facility. Patients underwent 29 DTMS treatments delivered over a 6-week period utilizing Brainsway’s Deep TMS (dTMS) platform and the H7 helmet. YBOCS were measured weekly.

Results
All 8 patients achieved at least partial response to treatment. Five patients achieved full (>30% reduction on the YBOCS) and 3 showed a partial (>20% reduction) response to treatment. Two of the 8 achieved full remission (<10 final YBOCS score). Severe deregulation (>2 SD) was found in delta, theta, and gamma bands at Fz (over the ACC) in 5 of 8 qEEGs. Eighty percent of patients who achieved a full response to treatment showed a severely deregulated ACC in the gamma band, in relative power. Also, for the 6 patients who had full genomic analyses, all shared the INS/INS genotype on ADRA2 and 5 of the 6 shared a MET/MET genotype on COMT.

Discussion
Our preliminary results support the use of dTMS, targeting the ACC, in the treatment of obsessional thinking. These findings also suggest that certain electroencephalographic and genomic markers may be associated with treatment response in OCD. The increased delta and theta frequencies found are associated with the perseverative nature of OCD while the increased gamma is associated with increased anxiety and worry. These findings mirror established qEEG patterns associated with OCD (Pacella 1944; Tot et al. 2002). The MET/MET genotype of COMT is linked with higher levels of dopamine in the prefrontal cortex associated with OCD (Sampaio et al. 2015). The ADRA2 genotype is associated with norepinephrine release and modulation and may be implicated in stress reactions in our severe cases (Cousijn et al. 2010).

References