International Society for ECT and Neurostimulation Annual Meeting Abstracts 2017

Cortisol Trajectory and Clinical Features as Predictors of ECT Response

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Background: Electroconvulsive therapy (ECT) is a unique treatment often considered for patients with severe, treatment-resistant depression. Unfortunately, ECT is burdensome and roughly one third of individuals do not respond. Reliable predictors of ECT response are needed. Excessive hypothalamic-pituitary-adrenal (HPA) axis activity has previously been linked with depression and ECT response, but reliable HPA biomarkers have not yet been identified.
Objective: We tested the hypothesis that cortisol trajectory predicts clinical response to ECT.
Methods: We performed a prospective, observational study of 114 participants with treatment-resistant depression (unipolar or bipolar). Cortisol trajectory was measured from samples of scalp hair from 39 participants just before undergoing ECT. Hair was cut into 1-cm segments, and cortisol concentration was quantified using a commercial immunoassay. Hair segments represented time periods approximately 0 to 4, 4 to 8, and 8 to 12 weeks before sampling.
Results: The ECT responder group showed an upward trajectory during the preceding 8-week period, whereas the nonresponder group showed a downward trajectory. A linear mixed model fit to hair cortisol concentration revealed a significant responder-by-time interaction ($\chi^2 = 8.5$, $df = 1$, $P = 0.004$), with no significant main effects of responder or time. A k-nearest-neighbors classification indicated that cortisol trajectory predicted responder status with 82% accuracy (88% sensitivity, 73% specificity) that surpassed the accuracy of clinical predictors.
Conclusions: Increasing cortisol trajectory during the preceding 8 weeks predicted subsequent response to ECT in our sample of individuals with treatment-resistant depression. A decreasing cortisol trajectory could indicate a different, ECT-nonresponsive form of depressive illness involving loss of adaptive HPA functioning.

ECT Is Effective and Improves Cognitive Outcomes in Schizophrenia: A Naturalistic Study of Treating Schizophrenia With Electroconvulsive Therapy

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Objective/Background: There is limited evidence regarding the relative treatment effectiveness and cognitive effects of different types of electroconvulsive therapy (ECT) in schizophrenia. In this study, we sought to compare the symptomatic and cognitive outcomes of patients with schizophrenia who received 1 of 4 different modalities of ECT treatment, namely bitemporal ECT with age-based dosing, right unilateral ECT with seizure-threshold–based dosing, bitemporal ECT with seizure-threshold–based dosing, and bifrontal ECT with seizure-threshold–based dosing ECT.
Design/Methods: The Brief Psychiatric Rating Scale (BPRS) and Montreal-Cognitive Assessment (MoCA) were administered to 62 patients before and after the ECT course. Significance was set at P value equals to 0.05.
Results: There was a significant improvement in both the BPRS scores (total and psychotic subscale of BPRS) (45.7 [SD, 11.8] to 31.7 [SD, 8.1] and 10.7 [SD, 6.4] to 5.3 [SD, 4.1], respectively) and MoCA (16.8 [SD, 9.1] to 20.7 [SD, 6.0]) across the patients after the course of ECT. The improvement in both BPRS and MoCA scores after ECT was not influenced by the type of ECT administered. The overall symptomatic response rate, defined as 40% or greater reduction in the psychotic subscale of BPRS, was 64.5%. The response rates did not significantly differ between the 4 types of ECT.
Conclusions: Our present findings suggest an acute course of ECT is effective in schizophrenia. Unexpectedly, our findings suggest that acute ECT treatment improves cognitive outcomes in this clinical population.

Electroconvulsive Therapy for Depression in Parkinson Disease

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Objective: We performed a systematic review of evidence regarding treatment of depression in Parkinson disease (PD) using electroconvulsive therapy (ECT).
Background: Depression in PD is highly prevalent (35% according to a recent systematic review) but often unrecognized and undertreated. Medications and psychotherapy have not been extensively investigated for treatment of depression in PD. Nonpharmacological treatment options such as transcranial magnetic stimulation and ECT have been described as being useful in this condition but have not found their way into treatment algorithms, likely for a variety of reasons including stigma associated with ECT, concerns about cognitive adverse effects of ECT, and lack of randomized controlled trials examining this treatment option.
Design/Methods: We searched available literature to find relevant articles discussing use of ECT in treatment of depression and PD. We included 43 articles in the final analysis, mainly case reports or case series, with the largest number of patients totaling 19.
Results: The analysis included 116 patients with depression and PD; depression improved in 93.1%. Where motor symptoms' severity was reported, 83% of patients improved. Cognition did not worsen in most (94%). Many patients experienced delirium or transient confusion, sometimes necessitating discontinuation of ECT. Little is known about maintenance ECT in this population.
Conclusions: Electroconvulsive therapy can benefit patients experiencing PD and depression, potentially also benefiting motor symptoms of PD. We recommend an algorithm for treatment of depression in PD, using ECT sooner rather than later.

Pre- and Postclerkship Knowledge, Perceptions, and Acceptability of Electroconvulsive Therapy in Medical Students

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Objective: The purpose of this study was to examine the impact of the third-year psychiatry clerkship on medical students' knowledge and opinion of electroconvulsive therapy (ECT) at the University of Missouri-Columbia School of Medicine.
Background: Despite overwhelming evidence of ECT's efficacy and safety for refractory affective illnesses, (among other conditions), it remains a misunderstood and underused intervention. Several studies indicate that ECT stigma and misinformation, unfortunately, do not spare the medical community. Medical students are an optimal group to study, because they are forming their perspectives on different specialties. Few studies have measured the effect of education programs (eg, clerkships, lectures, observation of ECT) on medical students' perspectives on ECT.
Design/Methods: All third-year medical students from February 2015 to May 2016 were asked to complete a 25-item Likert scale survey before and at the end of their psychiatry clerkship. Changes in survey responses from pre- and postclerkship were analyzed using the paired t test.
Results: Seventy-nine (n = 79) medical students (41 directly observed ECT) completed pre- and postrotation surveys. Students' knowledge of ECT's indications, procedure, adverse effects, and mechanism of action significantly improved from pre- to postclerkship. In addition, the medical students' opinions demonstrated a statistically significant improvement after the clerkship as well.

The medical students who directly observed ECT showed an even more favorable opinion of the procedure postclerkship.

Conclusions: Exposure to ECT, whether through education during the psychiatry clerkship or via direct observation, improves medical students' knowledge of and attitudes toward ECT. As previous studies have suggested, direct observation promotes the most positive opinions of ECT.

Transcranial Direct Current Stimulation Combined With Cognitive Training in Patients With Neuropsychiatric Disorders

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Objective: The purpose of this study was to investigate whether transcranial direct current stimulation (tDCS) combined with cognitive training (CT) enhances cognitive functioning.
Background: We have previously shown that tDCS causes short-term performance improvement over repeated CT sessions in healthy participants. Combining tDCS with CT therefore may be a useful strategy to enhance the therapeutic efficacy of CT in patients with neuropsychiatric conditions.
Methods: Data from 2 different double-blind randomized controlled trials will be presented. In the first study, 2 patients diagnosed with schizophrenia received 5 sessions of CT a week over 4 weeks with active tDCS given concurrently during CT 3 times a week for a total of 12 of the 20 CT sessions. Cognitive functioning, psychiatric symptomology, and day-to-day functioning were assessed at baseline, postintervention, and at 1-month follow-up. In the second study, 53 patients with aMCI were randomized to receive active or sham tDCS combined with CT administered 3 times a week over a total of 15 sessions. Cognitive outcomes were assessed at baseline, postintervention, and 3-month follow-up.
Results: Both patients with schizophrenia demonstrated large-sized cognitive improvements at postintervention, with both patients showing moderate-to-large–sized improvements at follow-up. In patients with aMCI, preliminary results show greater improvement in memory functioning at follow-up in patients who received active tDCS and CT compared with patients who received sham tDCS and CT.
Conclusions: Transcranial direct current stimulation combined with CT is safe and well tolerated and may have therapeutic potential for enhancing cognitive functioning in patients with neuropsychiatric conditions.

Implementation of Family-Centered Care for Electroconvulsive Therapy in an Ambulatory Clinic in Brazil

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Objective: The purpose of this study was to describe our experience in implementing family-centered care for electroconvulsive therapy (ECT) in an ambulatory clinic in Brazil.
Background: There is a strong tendency toward family-centered care in medicine. Family-centered care demonstrates many advantages in neonatal care, obstetrics, and other specialities. It has an additional unique advantage in electroconvulsive setting, which is helping families and patients to overcome their prejudice over ECT, which is still very common in our population.
Design: This is a single institutional experience report from Brazil.
Results: (1) Routine modifications such as allowing family members to watch sessions while receiving explanations about every action and patient responses (knowledge sharing); (2) live electroencephalogram tracings visible for staff and family—described and qualified (transparency); (3) discussion with patient and family about individual needs, concerns, and adverse effects, facilitating shared decision-making regarding electrode placement, session intervals, maintenance ECT, and anesthetic drugs making each treatment individualized (patient as a source of control and customized care); (4) publishing an online educational Web site with full information about ECT and family-centered ECT were essential for the perceived change in patients' and their families' opinions about ECT.
Conclusions: This family-centered implementation for ECT was an answer to a call for action published in *Journal of ECT* last year and, despite of all staff concerns in the beginning, we consider it successful as expected.

Propofol Dependence: A Case Report Initiated After Electroconvulsive Therapy Treatment and a Systematic Review

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Objective: The purpose of this study was to research about propofol dependence and report a case initiated after electroconvulsive therapy (ECT) treatment.
Background: Propofol is an anesthetic used in ECT. The first case of propofol addiction was reported in 1992. Since then, several cases have been reported.
Design: We performed a literature search on PubMed databases using "propofol" and "dependence or addiction" for eligible articles. We evaluated various parameters, including how use of propofol started comorbidity and dependence symptoms. After that, we report a case and compare with the others already reported.
Results: We identified 9 case reports and a series of cases. Two cases started after procedures that used propofol as anesthetic agent, endoscopy and colonoscopy. Other 2 cases started after using propofol for chronic pain. The others were health professional with recreational use. The case we report was a 20-year-old woman with a history of refractory unipolar depression. She received ECT and reported improvement (HAMD score went from 23 to 10 points). She had a relapse 1 week after the sessions ended. She was submitted to 6 more ECT sessions and improved again. Two days after, the patient expressed desire to go to a hospital to receive propofol and described some craving symptoms.
Conclusions: Propofol dependence after repetitive procedure is not well document. Because ECT is a treatment in which repetitive sessions are performed in a short time interval, physicians should be aware of the risk of propofol addiction and consider the patient risk of addiction when choosing the anesthetic agent.

The Effect of Transcranial Direct Current Stimulation on P50 Sensory Gating and Auditory Hallucination in Patients With Schizophrenia: A Pilot Study

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Objective: The aim of this study was to identify the underlying mechanism of transcranial direct current stimulation (tDCS) effect on auditory hallucination in patients with schizophrenia using P50 sensory gating.
Background: P50 sensory gating has been suggested as electrophysiological correlate of auditory hallucination in patients with schizophrenia. Although the effect of tDCS on auditory hallucination of patients with schizophrenia has been reported in several studies, the mechanism of action underlying these reported changes remains unknown.
Design/Methods: Ten patients with schizophrenia accompanying medication-refractory auditory hallucinations received 20 minutes of 2-mA tDCS twice a day for 5 consecutive weekdays. The anode was placed over the left dorsolateral prefrontal cortex and the cathode over the left temporoparietal cortex. Severity of auditory hallucination and P50 event-related potential were measured for each participant at baseline and after completion of tDCS applications.
Results: Auditory hallucinations were reduced with moderate effect size by tDCS use ($Z = -1.745$, $P = 0.081$). Although change in P50 sensory gating after the tDCS use did not reach statistical significance ($Z = -1.376$, $P = 0.169$), it showed significant association with improvement of auditory hallucination by tDCS when age and sex were considered as covariates ($r = 0.788$, $P = 0.020$).
Conclusions: Although this study is limited by its small sample size and lack of sham control, the results show that P50 sensory gating is a promising marker for revealing the underlying mechanism of tDCS effect on auditory hallucination in schizophrenia.

Key Words: transcranial direct current stimulation, schizophrenia, auditory hallucination, P50, sensory gating

Individualized Precision Targeting of Resting-State Networks With Transcranial Magnetic Stimulation

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Objective: The aim of this study was to evaluate individual-level resting-state network mapping (RSNM) for targeting specific neural networks via repetitive transcranial magnetic stimulation (rTMS).
Background: Resting-state functional magnetic resonance imaging (rsfMRI) studies have shown that antidepressant efficacy of rTMS is related to anticorrelation between treatment targets and subgenual anterior cingulate cortex (sgACC). Treatment also modulates sgACC-mediated interactions between dorsal attention network (DAN) and default mode network (DMN) as defined by group-mean parcellations. Although interindividual variability is better predicted by individualized RSNM, this has not been evaluated for rTMS targeting.
Methods: Individualized DAN and DMN maps were constructed from rsfMRI of 10 healthy controls and 8 subjects with traumatic brain injury–associated depression, which may exhibit exaggerated interindividual variability. Individualized targets were identified as the superficial dorsolateral prefrontal cluster with maximal DAN-DMN difference. Control targets were identified via previously described methods based on peak anticorrelation with sgACC. Targets were compared in terms of spatial distance and correlation with group-based DAN and DMN parcellations.
Results: In both groups, individualized targets showed stronger DAN correlation and DMN anticorrelation than control targets. Target coordinates were significantly distinct between methods, with spatial distance of 12.9 mm (95% confidence interval, 9.9–15.8) in traumatic brain injury–associated depression and 16.5 mm (95% confidence interval, 14.5–18.6) in healthy controls (Table 1).

TABLE 1. Connectivity of targets with DAN and DMN

	TBI-D			Healthy control		
	Individualized	Control	p	Individualized	Control	p
DAN	0.27	0.13	.03	0.32	0.19	.03
DMN	−0.35	−0.24	.01	−0.42	−0.23	.002

Conclusions: Compared with previously described rsfMRI-based methods, individual-level RSNM identifies spatially distinct rTMS targets with stronger DAN correlations and DMN anticorrelations. Future research should investigate how this affects clinical outcomes.

Repetitive Transcranial Magnetic Stimulation With Resting-State Network Targeting for Depression in Traumatic Brain Injury

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Objectives: The aim of this study was to investigate the use of repetitive transcranial magnetic stimulation (rTMS) targeted with individualized resting-state network mapping (RSNM) of dorsal attention network (DAN) and default mode network (DMN) in subjects with treatment-resistant depression associated with traumatic brain injury (TBI).
Background: Repetitive transcranial magnetic stimulation has demonstrated antidepressant efficacy but has not been tested in depression-associated TBI. Although functional magnetic resonance imaging (fMRI) has been suggested as a method for targeting rTMS, it is limited by reliance on group-mean connectivity maps from healthy control subjects, which may not be applicable to individual patients with neuropsychiatric disorders.
Methods: Subjects with TRD and TBI received resting-state fMRI scans with individual-level RSNM based on a machine-learning algorithm that classifies networks based on known interindividual variability. Subjects were randomized to 20 sessions of bilateral rTMS treatment (4000 left-sided excitatory pulses, 1000 right-sided inhibitory pulses) or sham. Treatment was targeted to the dorsolateral prefrontal cluster with maximal difference between DAN and DMN correlations. Pre- and posttreatment testing included Montgomery-Asberg Depression Rating Scale and resting-state fMRI.
Results: Preliminary data from the first 7 subjects showed mean Montgomery-Asberg Depression Rating Scale improvement of 63% ± 10% (n = 5) with active treatment and 30% ± 11% (n = 2) with sham. Active treatment was associated with increased anticorrelation between subgenual anterior cingulate cortex and DAN, increased correlation between subgenual anterior cingulate cortex and DMN, and increased cortico-limbic-striatal connectivity.
Conclusions: Repetitive transcranial magnetic stimulation targeted based on RSNM seems to cause mood effects and neural network dynamics reflecting the expected changes based on the stimulated networks. We are currently collecting additional data in a larger sample.

Efficacy of Repetitive Transcranial Magnetic Stimulation With Concurrent Cognitive Behavioral Therapy on Treatment-Resistant Depression

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Background: Repetitive transcranial magnetic stimulation (rTMS) and cognitive behavioral therapy (CBT) have proven to be effective in treating treatment-resistant depression (TRD); however, no studies have been done outlining their use or efficacy together.
Objective: The aim of this study was to ascertain efficacy of combined therapies on clinical response rates by analyzing TRD patients treated with rTMS monotherapy versus rTMS with concurrent CBT.
Methods: We retrospectively reviewed 100 patients (age, 18–65 years) who underwent Neurostar rTMS therapy for TRD at an outpatient center. All received the standard 36 sessions of rTMS therapy, but 60 patients received CBT by a licensed therapist during rTMS therapy sessions. Clinical progress was tracked using the Patient Health Questionnaire-9 (PHQ-9) and Montgomery-Asberg Depression Rating Scale (MADRS).
Results: Mean starting MADRS and PHQ-9 scores for monotherapy group were 33.9 and 19.8 and 30.7 and 21.4 for the dual therapy group, respectively. Patient response rate in the monotherapy group was 80.1% and 71.1%, and patient remission rate was 46.75% and 44.7% by MADRS and PHQ-9, respectively. End treatment mean MADRS and PHQ-9 scores for the monotherapy group were 13.3 and 6.7. Response rates of the concurrent therapy group were 92.3% and 94.2%, and remission rates were 70.1% and 80.7% for MADRS and PHQ-9 (P = 0.05), respectively. End treatment mean MADRS and PHQ-9 scores for the concurrent therapy group were 7.4 and 3.1.
Conclusion: The effects of rTMS therapy with concurrent CBT on TRD seemed to be synergistic, resulting in higher response and remission rates of depressive symptoms than those treated with rTMS monotherapy.

Comparison of Seizures Induced by Midline Electrode Placement Versus Traditional Placements: A Pilot Study

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Introduction: Conventional electrode placements for electroconvulsive therapy (ECT) sessions include bifrontal, bitemporal, left anterior right temporal, or right unilateral positions. We used midline (ML) electrode placement, that is, 1 electrode at the middle front of the forehead above the nasion, whereas the other electrode was placed on the posterior surface of the scalp superior to the inion in 12 of our patients and compared it with other electrode placements on parameters used for measuring seizures.
Methods: In this cross-sectional study, 11 of the 12 patients were switched to ML placement ECT after first receiving a number of conventional placement treatments, whereas 1 patient received ML ECT initially and was then switched to conventional placement. All sessions used a Thymatron System IV ECT device. Seizure indices including seizure duration, postictal suppression index, average seizure energy index, and maximum sustained coherence were compared for the ML and conventional sessions. Seizure indices were analyzed by using multivariate analysis.
Results: There were 280 ECT sessions using traditional electrode placements and 232 sessions using the ML electrode placement. Among the 280 sessions, 171 were with bifrontal, 44 with bitemporal, and 65 with right unilateral. All electrode placements showed similar results in terms of seizure indices in multivariate analysis.

Conclusions: We observed that ML electrode placement produced comparable results with conventional electrode positions regarding seizure parameters for ECT. This method of electrode placement may allow for ML brain structures posited to be aberrant during episodes of depression to be more directly targeted during ECT.

Electroconvulsive Therapy Post–Eye Surgery: Case Report and Literature Review

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Objective: The aim of this study was to investigate and discuss the current literature regarding the safety of electroconvulsive therapy (ECT) after eye surgery.
Background: There is little evidence to suggest the safety of ECT in patients post–eye surgery. Although the substantial yet transient increase in intraocular pressure (IOP) during ECT is well documented in several case reports, the clinical significance of this rise in pressure remains unclear because the literature is scarce.
Methods: We present a case of major depressive disorder in a woman post–cataract surgery treated with ECT. Intraocular pressure readings and vision acuity throughout treatment are reported as well as a review using an extensive PubMed search of the literature over the past 50 years published in the English language.
Results: An 80-year-old woman with a history of recurrent major depressive disorder, with a status of post–left eye cataract surgery with intraocular lens placement, presented with evidence of a major depressive episode 6 weeks after surgery. Pretreatment IOP (18 mm Hg OS), multiple intertreatment IOP (mean of 17 mm Hg OS), and posttreatment IOP (16 mm Hg OS) were measured and remained stable during 8 sessions of ECT. There were no changes in visual acuity. The patient was treated successfully without any complications.
Conclusions: This report documents the stability of IOP throughout a course of ECT without any complications 6 weeks post–eye surgery. A reasonable period for wound healing, prophylactic use of brimonidine/timolol to reduce IOP, and attenuation of the hypertensive surge were used to successfully and safely treat this patient.

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Electroconvulsive Therapy Augmentation on Clozapine in Treatment-Resistant Schizophrenia

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Objective: This study is aimed to explore the effectiveness of electroconvulsive therapy (ECT) augmentation on clozapine in treatment-resistant schizophrenia.
Background: Electroconvulsive therapy could be a reasonable option as an augmenting strategy for patients who are clozapine resistant, approximately 40% to 70% of patients with treatment-resistant schizophrenia.
Design/Methods: Patients with schizophrenia who received clozapine over 12 weeks with clozapine plasma levels of greater than 350 ng/mL were recruited and divided into the ECT group (ECT and clozapine) and the clozapine group (clozapine only). And, the changes of psychopathology were evaluated with the PANSS total scores and symptom factors.
Results: There were no demographic differences between the 2 groups. At baseline, the mean doses of clozapine in the ECT group were statistically significantly higher (367.9 ± 125.7 mg, N=14) than that in the clozapine group (250.0 ± 109.2 mg, N=16) but no differences in mean plasma levels of clozapine and norclozapine between the 2 groups, both at baseline and follow-up. The mean numbers of sessions and durations of index ECT in the ECT group were 14.9 (±4.6) and 44.9 (±15.4) days, respectively. In the ECT group, mean total PANSS score was reduced 19.3 (±10.1) significantly from 71.7 (±13.9) to 52.4 (±13.3) during index ECT. The mean percentage score reduction was 26.8% (±11.5%). Ten (71.4%) patients in the ECT group showed clinical remission by the definition of 20% reduction in PANSS score, but only 3 (18.8%) patients in the clozapine group did.
Conclusions: Electroconvulsive therapy augmentation showed substantial decreases of psychopathology without persistent adverse effects, suggesting that ECT could be a favorable augmenting strategy in the treatment of clozapine-resistant schizophrenia.

The Role of Patient Expectancy and Social Desirability in Treatment Outcomes of Electroconvulsive Therapy for Depression: An Assessment of Placebo Effects in the Current Practice of Electroconvulsive Therapy

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Objective: This study aims to assess placebo effects of electroconvulsive therapy (ECT) in a naturalistic cohort of depressed patients using patient expectancy and social desirability. We hypothesize that these predictors will influence ECT response only in the early phase of the treatment course and resolve when the biological effects of the ECT take predominance.
Background: Nonspecific effects, also called placebo effects, play a role in most medical therapies. These include regression to the mean, expectancy, and social desirability. However, these factors have not been examined in setting of modern ECT.
Methods: Mini-International Neuropsychiatric Interview Plus 6.0 was used to screen patients with unipolar or bipolar depression starting ECT. The Therapy Evaluation Questionnaire (TEQ) (a measure of expectancy) and 16-item Social Desirability Scale (SDS) were administered at baseline. The 24-item Hamilton Rating Scale for Depression (HRSD) and Inventory of Depressive Symptomatology Self-Report (IDS-SR) were performed at baseline and before each subsequent treatment.
Results: Ten subjects completed the study. The TEQ and SDS were not correlated with the ΔHRSD or ΔIDS-SR when examined with Pearson correlation. With repeated measure analysis of variance, TEQ significantly influenced the ΔHRSD (but not ΔIDS-SR) only after the first ECT treatment ($r^2 = 0.58$, coefficient = 0.817, $P = 0.032$). The SDS influence on ΔHRSD/ΔIDS-SR was not significant.
Conclusions: Preliminary data suggest that patient expectancy, but not social desirability, influences ECT antidepressant response after the first treatment. This effect is lost in subsequent treatments and final outcome, supporting the hypothesis that placebo factors affect ECT outcome for patients with depression only in the early phase of the treatment course.

Trends in Electroconvulsive Therapy Use in the Medicare Fee-for-Service Population 2000 to 2015

Patrick Ying, MD

Objective: The objective is to determine the frequency of use of electroconvulsive therapy (ECT) by Medicare beneficiaries and examine the trends over the past 15 years and among the 50 states.
Background: Medicare is a significant payor for important ECT populations, the elderly and the disabled. The past 15 years of Medicare claims data for ECT are available on the Centers for Medicare and Medicaid Services Web site with details at the state and provider level.

Design/Methods: Datasets representing Medicare Part B claims were downloaded from the cms.gov Web site, from 2000 to 2015, as well as a datasets representing state level and provider level claims in 2014. Rates of usage for CPT codes representing ECT, and psychiatric evaluations, and as well as the total number of Medicare beneficiaries were determined for the years 2000 to 2015. State and provider level data were examined to determine the frequency of ECT and the number of providers in each state as well as other characteristics of ECT providers.
Results: The number of ECT claims in the Medicare Part B system fell from 154,239 to a low of 133,303 in 2008 and has stabilized in 2015 to 140,131, whereas total FFS Part B beneficiaries and claims for psychiatric evaluations increased. In 2014, Medicare reported claims for ECT in 49 states and the District of Columbia, but none in Alaska.
Conclusions: The use of ECT in the Medicare FFS system seems to have stabilized over the past years, although not quite keeping pace with an increase in population. Efforts to support ECT programs and education should continue.

An Analysis of Electroconvulsive Therapy–Related Mortality in the United States From 1999 to 2015 Using a Nationwide Database

Patrick Ying, MD

Objective: The objective is to determine the frequency of electroconvulsive therapy (ECT)–related mortality in the United States, as well as the comorbid conditions that cause or contribute to death.
Background: Previous studies of ECT-related mortality suggest that ECT is an extremely safe procedure. To date, no survey of ECT-related mortality has been done using national death certificate data provided by the Centers for Disease Control.
Design/Methods: The CDC WONDER platform contains data from all death certificates filed in the United States from 1999 to 2015, which includes ICD-10 codes for the "Underlying Cause of Death" and additional contributing "Multiple Causes of Death." Searches for the ICD-10 codes representing complications from ECT were performed for both principal and contributing causes of death and for the corresponding contributing and principal causes of death in those cases.
Results: Over a 17-year period, 16 patients had their "Underlying Cause of Death" attributed to ECT complications, whereas 50 patients had ECT complications as a contributing cause of death. Advancing age increased risk of death. The most common contributing causes of death where ECT was the principal cause of death were cardiac and respiratory conditions. The most common principal causes of death where ECT was a contributing cause were aortic aneurysms, cardiac disease, and malignant neoplasms.
Conclusions: Electroconvulsive therapy remains an extremely safe procedure. Focus on cardiovascular and respiratory systems before ECT remains appropriate. Using conservative estimates for the number of ECT procedures performed over this time period puts the per-procedure mortality risk for ECT of approximately 1 in 100,000 comparable with the stated risks of general anesthesia.

Electroconvulsive Therapy Treatment in Patients With Somatic Symptom and Related Disorders

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Objective: In this study, we report on the effectiveness of electroconvulsive therapy (ECT) in patients with somatic symptom and related disorders (SSDs) or somatoform disorders (SDs).
Background: Medically unexplained somatic complaints are highly prevalent and lead to significant impairment and disability. The number of effective treatment modalities for SSDs or SDs remains limited.
Design/Methods: A retrospective chart review of all patients treated with an index course of ECT at the neuropsychiatric program at the University of British Columbia Hospital from 2000 to 2010 was conducted. The primary outcomes consisted of changes in pseudoneurologic symptoms, pain symptoms, cardiopulmonary symptoms, and gastrointestinal symptoms. Complaints were examined pre- and post-ECT.
Results: Twenty-eight participants were included in this study. Twenty-one participants received right unilateral ECT. Six received bifrontal ECT. One received bitemporal ECT. Eighteen of 21 participants reported improvement in pseudoneurologic Trends in ECT Utilization in the Medicare Fee-For-Servicesymptoms; 11 of 14 participants reported improvement in pain symptoms; 1 participant reported improvement in cardiopulmonary symptoms; and 1 of 2 participants reported improvement in gastrointestinal symptoms.
Conclusions: This retrospective study suggests that ECT could be included as part of the existing treatment for refractory SSD and SD, particularly in refractory cases with comorbid mood disorders.

Electroconvulsive Therapy in a Patient With Chronic Deep Vein Thrombosis Receiving Dabigatran Therapy: Case Report and Literature Review

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Objective: The aim of this study was to investigate and discuss the current literature regarding the safety of electroconvulsive therapy (ECT) in patients receiving dabigatran and other anticoagulation therapy.
Background: Potential intracerebral hemorrhage is a concern using ECT with concomitant anticoagulation therapy. There is evidence in the form of case reports and case series that reveal the safe use of warfarin therapy during ECT; however, there is little evidence to suggest the safety of ECT in patients receiving any of the new oral anticoagulation agents. The newer agents offer a more predictable pharmacokinetic profile with less intense monitoring and similar efficacy and adverse event incidence compared with warfarin.
Methods: We present a case of catatonia treated with ECT in a patient with concomitant anticoagulation therapy on dabigatran for chronic deep vein thrombosis (DVT). A review of the literature using an extensive PubMed search over the past 30 years published in the English language is also presented.
Results: A 52-year-old man with a history of bipolar disorder and medical history significant for chronic DVT presented with catatonia and a chronic right lower extremity DVT treated with dabigatran therapy. The patient improved remarkably with ECT and without any adverse events.
Conclusions: We report the safe and effective use of ECT in a patient receiving dabigatran therapy. Proper dosing based on creatinine clearance and pretreatment modification to maintain normal blood pressure were used to successfully and safely treat this patient. To our knowledge, this is only the third case report examining ECT and dabigatran therapy. The evidence to establish safety remains insufficient. Further prospective investigation is needed for all anticoagulation therapy and ECT.

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What Is in Electroconvulsive Therapy Procedure Notes? Evolving a Standard Template

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Objective: The aim of this study was to identify content in electroconvulsive therapy (ECT) procedure notes.
Background: No accepted standard exists for content of ECT procedure notes. JCAHO generic procedure criteria (IM.6.30) mandate classic items: provider, name and description of procedure, blood loss, specimens, and complications.

The American Psychiatric Association (APA) ECT Task Force Report (2001) lists electrode placement, stimulus parameters, seizure duration *and/or* adequacy, and complications (14.4.2). The Royal College of Psychiatry (ECTAS, 2016) lists electrode placement, charge, seizure duration *and* quality, and adverse effects (M6.12). Additional ECTAS standards include the following: CGI each session (7.11), weekly mood scales (7.11.1), and periodic cognitive scales (7.12). We sought to examine ECT procedure notes in contemporary clinical practice.
Method: A major EMR corporation's library of user-created ECT-procedure templates, each including "drop-down" and customized text, was searched and compared with APA and ECTAS guidelines.
Results: To date, 84 templates representing a spectrum of academic and other facilities were examined. The most frequent items were electrode placement (95%), seizure duration (91%), tolerability/adverse effects (74%), and stimulus energy/charge (74%). Less frequent items included judgments or indices of seizure adequacy (42%) and clinical or scale-based mood (35%) or cognitive (31%) assessments. Sixty-nine percent of templates satisfied APA guidelines, 30% ECTAS M6.12 guidelines, and less than 5% met the additional ECTAS guidelines.
Conclusions: Contemporary ECT note templates generally satisfy minimal or basic procedural criteria. Standardized EMR templates endorsed by ISEN or other organizations would foster systematic data collection on practice and outcomes across large populations and could be easily disseminated. To this end, the authors will present a draft model template.

Left Unilateral Electroconvulsive Therapy in the Presence of an Occipital Nerve Stimulator and Metal Fragments

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Objective: In this report, we detail the use of left unilateral electroconvulsive therapy (ECT) in a right-handed woman because of ballistic fragment location and the presence of an occipital nerve stimulator (ONS). This is the first case report of the use of ECT in a patient with an ONS.
Design/Methods: We present the case of a 36-year-old woman with a history of major depressive disorder, who attempted suicide by gunshot at close range to the right temple. The patient had multiple ballistic fragments along the trajectory of the entrance through the right frontal bone with termination of the dominant fragment in the right temporal lobe. To repair the damage, she also had a metallic mesh overlying the right frontal bone. Of note, this patient also had a longstanding history of migraines and had an ONS placed years before with leads extending to bilateral supraorbital nerves as well and resting just above the supraorbital bones. This case required coordination with ONS manufacture representatives to assure the device was in a nonfunctioning mode before starting ECT as well as for follow-up interrogation after the index was complete.
Results: The patient underwent 10 ECT sessions with good-quality seizures. The Montgomery-Åsberg Depression Rating Scale showed significant improvement from 31 to 4 over the course of the index.
Conclusions: Strategic placement of ECT electrodes in patients with residual ballistic fragments and an ONS can successfully treat resistant depression with minimal adverse effects and preserve the functionality of the implant.

Disordered Personality Traits Do Not Predict Response to Repetitive Transcranial Magnetic Stimulation in Major Depression

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Objective: The aim of the study was to identify the effect of disordered personality traits on clinical response to repetitive transcranial magnetic stimulation (rTMS) for major depression.
Background: The Temperament and Character Inventory (TCI) measures multiple dimensions of adaptive functioning in an effort to characterize human personality. Temperament traits, which have neurobiological underpinnings, have been used to predict response to pharmacotherapy and cognitive-behavioral therapy. Character traits measure social adaptation to identify personality pathology; low scores consistently correlate with high symptom counts for personality disorder. Persistence, one of the temperament traits, has been demonstrated to correlate with antidepressant response to rTMS, but there is limited literature on effects of disordered personality on rTMS response.
Design/Methods: Twenty-five subjects completed a baseline TCI before a standard clinical course of rTMS for major depression. Response was defined as 50% improvement on the Hamilton Rating Scale for Depression. The TCI character scores were compared between responders and nonresponders via unpaired *t* test. Pearson correlations were calculated for the relationship between character scores and rTMS response.
Results: Fourteen of the 25 patients met criteria for clinical response. Mean character *t* score was 41.2 (95% confidence interval, 36.4–45.9) for responders and 40.1 (95% confidence interval, 30.6–49.5) for nonresponders ($P = 0.75$). There was minimal correlation between character score and Hamilton Rating Scale for Depression change ($r = 0.07$).
Conclusions: Using low TCI character scores as a proxy for disordered personality, these results suggest that personality disorder traits do not predict rTMS response. This may contradict an underlying bias that personality disorder traits imbue increased resistance to biological interventions for depressive symptoms.

Functional Magnetic Resonance Imaging–Navigated Repetitive Transcranial Magnetic Stimulation of the Dorsal Attention Network Alters Functional Connectivity in a Predictable Manner

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Objective: The aim of this study was to develop a linear model for prediction of resting-state network changes with repetitive transcranial magnetic stimulation (rTMS).
Background: Although rTMS has been shown to alter resting-state functional connectivity in related regions of the brain, there are minimal data on expected change in resting-state functional connectivity as a function of baseline connectivity in individuals. The recent advent of individualized resting-state network mapping makes it possible to generate a more precise prediction model.
Design/Methods: Five subjects with depression after brain injury underwent 20 sessions of high-frequency left-sided and low-frequency right-sided rTMS as part of an ongoing clinical trial. Stimulation was targeted to the prefrontal node with maximum anticorrelation between dorsal attention network (DAN) and DMN as defined by an individualized resting-state network mapping algorithm. Baseline FC was compared with change in FC between/within 7 individualized cortical network parcels on both sides via linear regression.
Results: Baseline FC was directly related to change in FC for the 4 left/right DAN-DMN correlations (mean Fisher $z = 0.59$; 95% confidence interval, 0.31–0.87) despite a strong inverse relationship for other network-network correlations (mean $z = -0.90$; 95% confidence interval, −1.12 to −0.68). Unpaired *t* test revealed Bonferroni-corrected $P = 0.017$. The DAN correlations changed in the opposite direction to group-mean connectivity, whereas all other network correlations regressed toward the mean.
Conclusions: Repetitive transcranial magnetic stimulation with individualized network targeting induced FC changes in a manner that may be predicted by baseline FC in the targeted network and in other networks. Further research will apply this approach in larger datasets to develop a generalizable prediction model.

Electroconvulsive Therapy Followed by Repetitive Transcranial Magnetic Stimulation to Severe Depression With Suicide Ideation

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Objective: We reported a case of a man with severe depressive disorder and suicide ideation undergone to 4 electroconvulsive therapies (ECTs) followed by 15 repetitive transcranial magnetic stimulation (rTMS) sessions
Background: Electroconvulsive therapy has been considered the most powerful method to severe depressive disorders reaching up to 90% of response in clinical trials. However, it is usually associated with transient cognitive impairment. In contrast, rTMS has demonstrated reasonable efficacy and tolerability for depression with rare adverse cognitive effects. Double-cone coil consists in a novel coil model composed of 2 angled wings that provide a great balance between focality and depth of electromagnetic field.
Method: Report of a single case.
Results: Man, 28 years old. During his adolescence, he began to feel sadness, lack of pleasure, social isolation, and concentration problems. At 19, he started

psychotherapy and psychiatric treatment receiving antidepressants. In the past year, his symptoms worsened with deep sorrow, pessimism, and persistent suicidal ideation. He was tried with escitalpram 20 mg, aripiprazole 15 mg, and methylphenidate 36 mg without clinical response. After 4 ECT sessions, his mood was better and suicide thoughts disappeared. Because of cognitive adverse effects, we interrupted ECT and proceeded 15 rTMS sessions, at 10 Hz, with DCC over the left dorsolateral prefrontal cortex. At the end of this, the depressive disorder remitted without any complaint about cognitive adverse effects

Conclusions: Few ECT sessions followed by rTMS could be a very useful choice to severely depressed patients who do not tolerate a higher number of ECT treatments.

A Machine Learning Approach Using Fractal Electroencephalography Features Predicts Response to Electroconvulsive Therapy

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Objective: The aim of this study was to investigate whether applying machine learning methodologies to electroencephalography (EEG) data obtained during the first electroconvulsive therapy (ECT) session can predict the response to treatment.

Background: The ECT treatment EEG can provide information to help predict response. Fractal analysis has proven to be a useful tool for measuring EEG complexity, and in this study, we examine its use as a predictor of response to ECT.

Methods: Sixty-two patients underwent an acute course of ECT, and 2-channel EEG data (Fp1, Fp2) from the first ECT session were collected. Response to ECT was defined as a reduction of 50% or more in Patient Health Questionnaire score at the end of treatment compared with baseline. A feature matrix was constructed containing EEG fractal measures, coherence measures, treatment parameters, and clinical variables. To reduce the dimensionality of the feature matrix, forward sequential feature selection with cross-validation was used. From this, the most significant features were identified and entered into a linear support vector machine classifier, which performed response prediction in a 10-fold cross-validation procedure.

Results: Sixteen discriminating EEG features were selected from the original set of 223 features. The classification model predicted response with an estimated accuracy of 72.6%. Area under the ROC curve was 74.4%.

Conclusions: These preliminary findings suggest that fractal analysis of EEG data can predict response to ECT. Future studies using a larger sample size and more EEG channels may help to achieve an area under the ROC curve value greater than 80%, thus generating a clinically useful tool for predicting ECT treatment outcomes.