



Unraveling the Importance of Seizure Duration in Electroconvulsive Therapy

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Electroconvulsive therapy (ECT) has a long history as an effective treatment for a range of psychiatric conditions. While the precise mechanism of action of ECT remains uncertain, the induction of a therapeutic seizure is a necessary part of the treatment. A seizure in and of itself, however, is not sufficient for improvement because different electrical doses and electrode placements may result in clinically similar seizures but yield vastly different therapeutic outcomes.¹ Thus, research over many decades has explored ECT-induced seizures, with the hopes of identifying properties of the therapeutic seizure that may be important for clinical effectiveness.² The simplest and most studied of these properties is the duration of the seizure either as observed clinically (via convulsive movements) or electrographically. It has been a long-held belief that short seizures may not be as clinically effective as longer ones, but there has been little empirical support for this clinical observation. Gillving and colleagues³ explored this question in a large registry-based cohort study of Swedish patients with depression undergoing treatment with ECT. The findings provide evidence for the relative ineffectiveness of short (less than 20 seconds) initial seizures at relieving symptoms of depression.

The authors used the Swedish National Quality Register for ECT, which covers the majority of ECT treatments performed in Sweden, to examine individuals with unipolar major depression who were receiving treatment with right unilateral ECT and who provided self-assessment of their depression using the Montgomery-Åsberg Depression Rating Scale (MADRS-S).³ The study focused on seizure duration, as measured by single-channel electroencephalography, at time of first treatment and its association with clinical depression response in univariate models and models adjusted for demographic and treatment parameters.

The nationwide clinical database provided a large sample size of 6998 ECT recipients. Consistent with most other ECT studies, the present study had a population of predominantly female (60.4%) and older (mean [SD] age, 55.2 [18.6] years) patients, with 39.3% achieving remission from depression (based on MADRS-S scores) after a median (IQR) of 7 (6-9) ECT sessions. Both older age and psychotic depression were associated with higher odds of remission after ECT treatment, which is again consistent with findings from prior ECT literature. The concomitant use of anticonvulsant medications (including lamotrigine) or benzodiazepines was associated with lower odds of remission, while the use of antidepressants, lithium, or antipsychotics was not associated with differential odds of remission. In univariate and multivariate models, seizure duration of at least 20 seconds at the time of first treatment was associated with higher odds of remission than an initial seizure duration of less than 20 seconds, with an odds ratio of 2.17 (univariate) and 2.52 (multivariate) for seizure duration of 60 to 69 seconds vs less than 20 seconds.

Overall, these results lend strong evidence to the notion that short seizures at the time of first ECT treatment portend a less favorable outcome than longer initial seizures. Generalizability of these findings is enhanced by the large sample size, the inclusion of multiple hospitals with independent clinical protocols, the use of ECT devices by different manufacturers, and the use of different anesthetic agents (propofol and thiopental) at different study sites.

Caution is required, however, in extrapolating from findings at the time of first seizure to analysis of seizures in the overall ECT course. First, and most importantly, even among those with initial seizures of less than 20 seconds the remission rate from depression was 27.2%, which is much greater than that obtained by pharmacotherapy in patients with treatment resistance. As a result, a short seizure at the time of first treatment should not be a reason to discontinue ECT in patients for

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whom treatment is indicated. Moreover, in many ways the first ECT treatment, particularly for right unilateral electrode placement as used in this study, is unlike subsequent treatments. At most centers, the first seizure is used to find the individual seizure threshold (the dose of electricity required to induce a seizure in a particular patient),⁴ with subsequent right unilateral treatments delivered at a multiple (6-fold or greater) of this initial threshold.¹ Prior large-scale cohort studies have demonstrated reduced seizure duration in subsequent treatments, with the greatest reduction occurring between the first and second treatments.⁵ It is unclear whether seizures at subsequent treatments of less than 20 seconds may also be associated with poorer outcomes, especially since prior evidence suggests that cumulative seizure duration over the course of treatment is not associated with effectiveness.⁶ Because this study was limited to treatments with unilateral ECT, its generalizability to other electrode placements is also uncertain.

How, then, should the findings of this study be brought into practice? The most actionable finding for ECT practitioners is the inverse association of benzodiazepines and anticonvulsants with ECT effectiveness. While prior studies have not found these medications to be associated with shorter initial seizures,⁷ in this large sample the use of either medication class was associated with lower odds of remission. As discussed by Gillving and colleagues,³ this finding could be confounded by indication (for instance, patients being given anticonvulsants because they did not respond to other medications, making them more treatment resistant), but cautious tapering of these medications prior to ECT may enhance treatment outcome. For researchers, a key conclusion of the study is that the manifestations of the therapeutic seizure, in this case its duration, contain information about the effectiveness of ECT. Results of this study support the need to search for more sophisticated measures for assessing the quality of ECT-induced seizures, as the results suggest that there is indeed a sign of treatment effectiveness to be found.

ARTICLE INFORMATION

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