





# Increased Stimulation Intensity Helped to Cope with Prolonged Seizures During the Next Round of Modified Electroconvulsive Therapy: A Case Report

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**Background:** Numerous protocols exist to counteract prolonged seizures during modified electroconvulsive therapy (mECT), such as anaesthetic adjustments and ventilation. Evidence on methods for deciding whether to continue with the next round of mECT after a prolonged seizure and to prevent recurrent seizures is currently not well established.

**Case Presentation:** The patient was a 76-year-old woman with major depressive disorder. She suffered from depressive symptoms such as decreased appetite, anxiety, and agitation. She was admitted to our hospital for mECT for the fifth time. The mECT was bilateral and started at 35% stimulus intensity, and effective convulsions were obtained for the first time. During the 8th mECT at the same intensity (35% stimulus intensity), an unexpected prolonged seizure of 966 s (over 16 minutes) occurred. The seizure was abruptly stopped with diazepam 10 mg and midazolam 2 mg. During the ninth mECT session, the stimulation intensity was increased to 50%, which resulted in effective seizures and no prolonged seizures. Subsequently, appropriate convulsions were obtained with the same stimulation intensity, and she completed 12 sessions. Her depressive symptoms improved, and she was discharged on the 45th day of hospitalization.

**Conclusion:** Prolonged seizures in mECT can be prevented by raising the stimulation intensity during the following cycle.

**Keywords:** mECT, non drug therapy, major depressive disorder, guideline

## Introduction

Modified electroconvulsive therapy (mECT) is strongly recommended treatment option for the major depressive disorder resistant to drug treatment.<sup>1</sup> In general, the safety profile of mECT is relatively good; however, in rare cases, complications of prolonged seizures lasting longer than 180 s may occur.<sup>2</sup> Prolonged seizures during mECT are reported at 1–2%.<sup>3</sup> There are many protocols to counteract prolonged seizures during mECT, such as anesthetic adjustments and ventilation.<sup>4</sup> Evidence on methods for deciding whether to continue with the next round of mECT after a prolonged seizure and prevent recurrent seizures is currently not well established. However, the clinician's choice to discontinue mECT due to the onset of prolonged seizures may lead to difficulties in treating the patient's main disease and compromise the therapeutic benefits. A previous report showed that right unilateral electroconvulsive therapy could cope with prolonged seizures by increasing the stimulus intensity.<sup>5</sup>

This report showed that increased stimulation intensity helped to cope with a prolonged seizure during the next round of mECT on both sides.

## Case Report

The patient was a 76-year-old woman. At the age of 70, when she was admitted to our hospital's department of collagen medicine with polymyositis, she developed a depressive state for the first time and was subsequently treated by the

department of psychiatry. She was diagnosed with major depressive disorder by diagnostic and statistical manual of mental disorders IV-TR and treated with mirtazapine 45 mg; however, her depressive state and anxiety agitation did not improve. Thereafter, she failed to respond to various drug therapies, including escitalopram, venlafaxine, vortioxetine, and augmentation with aripiprazole, and she underwent initial mECT at the age of 72. The depressive state improved immediately after mECT, but she relapsed several times, requiring mECT each time.

At the age of 76, she was admitted to our hospital to undergo mECT for the fifth time because of recurrent depressive symptoms such as decreased appetite, anxiety, and agitation. After admission, vortioxetine 10 mg and olanzapine 10 mg were tapered off. Quetiapine 50 mg, suvorexant 15 mg, and trazodone 25 mg were continued. Propofol (1.0 mg/kg) was administered intravenously, and rocuronium bromide (1.0 mg/kg) was given to avoid muscle contractions. After induction of anesthesia, suxamethonium chloride (4.0–5.0 mg/kg) was administered intravenously as a muscle relaxant. The mECT was bilateral and started at 35% stimulus intensity, and effective convulsions were obtained for the first time. However, during the 8th mECT at the same intensity (35% stimulus intensity), an unexpected prolonged seizure of 966 s (over 16 minutes) occurred. The seizure was abruptly stopped with diazepam 10 mg and midazolam 2 mg. There were no tardive seizures. The patient had used a range of antidepressants in the past with poor efficacy, therefore, we considered continuing mECT could be reasonable to improve her depressive symptoms.

During the ninth mECT session, the stimulation intensity was increased to 50%, which resulted in effective seizures and no prolonged seizures. Subsequently, appropriate convulsions were obtained with the same stimulation intensity, and she completed 12 sessions. Her depressive symptoms improved both subjective and objective, and she was discharged on the 45th day of hospitalization.

## Discussion

This report has two main clinical indications. Prolonged seizures in mECT can be prevented by raising the stimulation intensity during the following cycle. This method was also effective in the next mECT after a prolonged convulsion lasting over 16 minutes.

While in general, the safety profile of mECT is relatively good, some rare cases of complications of prolonged seizures lasting longer than 180 s have been reported at 1–2%.<sup>2,3</sup> One hypothesized mechanism for developing prolonged seizures is that when the amount of stimulation approximates the seizure threshold, the brain's inhibitory mechanisms fail to recognize the seizure and terminate it.<sup>5</sup> A suprathreshold stimulus dose would readily employ these inhibitory mechanisms.<sup>5</sup> Some reports suggested that seizure duration appears to be inversely related to the amount of stimulation.<sup>6</sup> Increasing the stimulus dose in the second mECT treatment after the first titration session results in significantly shorter seizure duration.<sup>7</sup> This case report was consistent with the above hypothesis and showed that prolonged convulsions of just over 16 minutes could be dealt by increasing the intensity of the next stimulus. Seizure thresholds could increase in parallel with mECT frequency.<sup>8</sup> As mECT seizure quality was strongly correlated with the decrease of depressive symptom,<sup>9</sup> the method of increasing stimulus intensity was appropriate. To the best of our knowledge, this is the first report in which prolonged seizures longer than 16 minutes could be suppressed by only increasing stimulus intensity in the next mECT.

Prolonged seizures can occur suddenly, although, in patients with multiple previous mECT sessions such as ours, the appearance of a prolonged seizure during mECT does not immediately preclude the use of mECT the next time it is performed. The length of the prolonged duration is also not a direct cause for hesitation to use mECT again. The risks and benefits need to be carefully weighed when deciding whether to provide mECT after prolonged seizures. However, the present case implies that prolonged seizures can be prevented by raising the intensity of stimulation during the following cycle. We could not generalize the case for major depressive disorder with mECT, accumulating such cases must be done.

## Conclusion

In conclusion, the present case implies that prolonged seizures in mECT can be prevented by raising the stimulation intensity during the following cycle.

## Data Sharing Statement

The data sets used and/or analyzed during the current case report are available from the corresponding author upon reasonable request.

## Ethical Approval and Consent for Publication

All of the actions described in this study have been conducted in accordance with ethical guidelines. Informed consent was obtained from the patient for the publication of her anonymous information in this manuscript. This study was a case report and Ethics Committee of the University of Occupational and Environmental Health excused the review.

## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors report no conflicts of interest in this work.

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