

The information in this column is not intended as a definitive treatment strategy but as a suggested approach for clinicians treating patients with similar histories. Individual cases may vary and should be evaluated carefully before treatment is provided. The patient described in this column gave informed consent for the publication of the column.

### Treating resistant depression with 2 forms of convulsive therapy: a clinical case study

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Electroconvulsive therapy (ECT) is effective for treatment-resistant depression, but its use is limited owing largely to stigma and its cognitive adverse effects. Magnetic seizure therapy (MST) is a new, alternative seizure treatment for treatment-resistant depression (TRD), and early studies suggest that MST does not produce any adverse effects on memory.<sup>1</sup>

These differences between ECT and MST are best illustrated in the clinical case of a 34-year-old patient with a longstanding history of TRD. Numerous trials of antidepressant medications (selective serotonin reuptake inhibitors, tricyclic antidepressants) had failed while she continued to experience marked depressive symptoms with passive suicidal ideation. She began a course of ECT in 2012. She experienced a marked improvement in depressive symptoms following 10 right-unilateral ultrabrief ECT treatments delivered 2–3 times per week on nonconsecutive days. She also reported subjective worsening of memory; ECT was discontinued as she could no longer tolerate this memory impairment. Unfortunately, she experienced a marked worsening of depressed mood within 1 month of discontinuing ECT. At that time, her 24-item Hamilton Rating Scale for Depression (HAM-D) score was 29. Given her response to ECT and lack of response to numerous antidepressants, the only viable option to be considered was an alternative seizure treatment. She was offered a course of MST as part of a clinical trial at the Centre for Addiction and Mental Health. She received 9 MST treatments, delivered bilaterally over the

frontal cortex using the Tonic Mag-Pro MST and twin coil, and she experienced complete remission of her depressive symptoms as indexed by the 24-item HAM-D. Subjectively, she reported no memory loss. This patient continues to be treated with MST on a maintenance basis, and she remains in remission of depressive symptoms.

Electroconvulsive therapy was first introduced in Italy by Ugo Cerletti and Lucio Bini in 1938.<sup>2</sup> Within a few years, the therapeutic benefit of ECT became widely recognized, and it was quickly adopted as a treatment for severe and persistent mental illness across the globe. Evidence suggests that 50%–75% of patients with TRD experience significant improvement with ECT — more than any other treatment option for this disorder.<sup>3</sup> By delivering a series of electrical stimuli to the cortex, ECT produces a generalized seizure. This seizure has been shown to release neurotransmitters, including serotonin, dopamine and noradrenaline.<sup>4</sup> It has been postulated that deficiencies in these neurotransmitters are associated with depression and that the release of these neurotransmitters has been linked to the therapeutic effects of ECT.<sup>4</sup> Additionally, ECT may also have antidepressant effects by increasing cerebral blood flow and by improving synaptic plasticity.<sup>5</sup>

Many patients, however, are reluctant to undergo ECT, and fewer than 1% of patients with TRD receive ECT.<sup>6</sup> There are likely 2 main reasons. The first is that ECT is highly stigmatized in our society, in part because of the negative stereotype of ECT delivery — as shown in *One Flew Over the Cuckoo's Nest*. A second reason limiting the use of ECT is its effect on memory. Most patients receiving ECT experience some degree of both anterograde and retrograde amnesia.

Magnetic seizure therapy was first developed in 1998 as a potential alter-

native treatment to ECT in patients with TRD.<sup>7</sup> It delivers a focused magnetic field that produces a seizure; MST activates the cortex in a focal manner, as magnetic fields are not shunted by the skull and are not volume-conducted by the cerebrospinal fluid, unlike with ECT.<sup>8</sup> As such, studies suggest that MST does not interfere with memory, as it does not affect deeper brain regions (e.g., hippocampus).<sup>1</sup> Studies suggest that MST produces significant mood improvements without any significant cognitive impairment<sup>9,10</sup> and show that MST can produce remission of suicidal ideation.<sup>11</sup> However, further research is needed to determine if the clinical efficacy of MST is comparable to that of ECT.<sup>12</sup>

Although studies comparing ECT with MST report comparable clinical efficacy with superiority of MST in relation to cognition,<sup>9,10</sup> to our knowledge there are no case reports illustrating within-patient effects of ECT and MST in relation to clinical outcomes and adverse effects on memory. The present case highlights these differences in adverse effects in a single patient and emphasizes the importance of offering advancements in seizure treatments to patients with TRD.

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