Major depression is a very common illness encountered in psychiatric practice. A difficult challenge in the treatment of major depression/bipolar depression is the management of treatment resistance. We frequently see patients who are treatment-resistant being prescribed various mood stabilizers, including anticonvulsants, second-generation antipsychotics, as well as lithium. Lithium has a major role in the maintenance treatment of bipolar illness and adjunctively in recurrent unipolar depression. Patients who do not respond completely to psychopharmacological approaches may require somatic treatment, including electroconvulsive therapy (ECT). ECT performed with concomitant anticonvulsants, antidepressants, and lithium remains controversial. There is no clear consensus in the literature as to whether performing ECT on a patient who is being prescribed lithium is safe. One issue with the data on concomitant use of lithium and ECT is that all of the studies are retrospective in nature. Therefore, it is difficult for the treating psychiatrist to have the necessary data to make the best decision with regard to combining ECT and lithium. Because lithium is known to have antisucidal properties, the discontinuation can have significant implications while ECT is being performed.

As stated, there is still some controversy regarding combining lithium and ECT. A review article by Dolenc and Rasmussen described 12 patients in whom the combination of lithium and ECT did not result in any adverse events. Dolenc and Rasmussen reviewed virtually all of the literature on ECT and lithium and found most to be anecdotal and retrospective. A case report by Sartorus et al described three cases of severe lithium-induced side effects with patients undergoing ECT. These specific side effects consisted of prolonged seizures, serotonin syndrome, and a focal seizure. Case reports by Conway and Nelson describe a prolonged seizure when ECT was performed while the patient was taking a combination of bupropion, venlafaxine, and lithium. A similar article written by Rucker and Cook described a prolonged seizure with ECT and concomitant clomipramine, lithium, l-tryptophan, quetiapine, and thyroxine. The complexity of polypharmacy in these cases raises the question about the role of lithium toxicity in the pathogenesis of prolonged seizures.

There were several concerns raised in the review by Dolenc and Rasmussen regarding the safety of ECT and lithium. First was the theoretical basis that the neuromuscular blockade by succinylcholine would prolong the time to spontaneous respiration in conjunction with lithium. Succinylcholine is routinely administered during ECT as a safety measure to prevent complications such as fractures. The data appear to be inconclusive; however, this does not seem to be a major cause for concern. It is a fact that a side effect of lithium can be delirium and cognitive dysfunction, even in patients not being treated simultaneously with ECT. The second concern was that lithium combined with ECT would increase the risk of delirium. A small sample reported by Milstein and Small re-

Lithium and Electroconvulsive Therapy: A Case Report
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ported more memory impairment in ECT with concomitant lithium combination patients compared with ECT controls; however, there was no cognitive impairment noted on neuropsychological testing in this sample. The other major concern was the possibility of prolonged seizures in a patient treated with lithium and ECT. There is evidence that lithium may have a tendency to lower seizure threshold, resulting in the possibility of prolonged seizure activity. There are several postulated mechanisms, including synergistic ECT and lithium convulsive susceptibility, as well as the combined effect of lithium and ECT on the noradrenergic system. This can be a potentially serious complication if not recognized. Despite all of the current literature, there is no real agreement regarding the safety of the combination of lithium or other mood stabilizers and ECT.

We present two cases of patients treated with lithium and ECT, one of whom had an extreme adverse event of prolonged seizure.

**CASE 1**

A 33-year-old Mexican man who was single, unemployed, and living with his cousin was referred to Elmhurst Hospital Center for ECT from Queens Hospital Center inpatient services. At Queens Hospital Center, medication treatment, partial hospitalization program, and inpatient hospitalization failed to relieve symptoms of depression and suicidal ideations. The patient had a history of a suicide attempt in December 2008 that consisted of overdosing on acetaminophen on the day following his 33rd birthday. He reported two prior psychiatric hospitalizations within the past 6 months secondary to suicidal ideations and depressed mood. At the time of his admission to our service, the patient was on the following medication regimen: venlafaxine 150 mg twice daily, aripiprazole 20 mg in the morning, clonazepam 2 mg at bedtime, and lithium 300 mg twice daily, with lithium level of 0.47 mEq/L on admission.

During the initial interview, the patient reported feelings of loneliness and emptiness since his childhood. Additionally, he stated that at age 12 he made a promise to kill himself at age 33 years. He chose that age because it was the age of Jesus Christ’s when he was crucified. Prior to his suicide attempt, he left his job and spent most of his days alone at home searching the Internet for different methods of suicide. Family members reported the patient’s behavior became increasingly strange (eg, telling his family members that he did not need food to survive).

On admission, the patient was fairly groomed and appeared to be his stated age. He was cooperative, with normal psychomotor activity and normal speech. His mood was depressed and sad with constricted and congruent affect. His thought process was linear and goal directed, and his thought content was remarkable for anhedonia. He expressed suicidal ideations with an ambivalent plan but denied homicidal ideations or intent. The patient denied any perceptual disturbances, and delusions were not elicited. He was awake, alert, and oriented to person, place, and time. His intelligence was estimated to be average. His insight and judgment were poor.

His medication regimen was slightly modified upon admission: venlafaxine was decreased from 150 mg twice daily to 75 mg in the morning and 150 mg at bedtime. The patient’s lab results and electrocardiogram were within normal limits. He had no known medical problems. Initially, the patient stated feeling depressed with flat and sad affect. He denied active suicidal and homicidal ideations but reported passive suicidal ideations, stating “if nothing works out, I will stay out for 1 month and then I will kill myself by stabbing my chest with a knife.” The patient remained helpless and hopeless and continued to voice significantly worrisome suicidal ideation.

Due to the severity of the symptoms and lack of response to previous treatment, a decision was made to proceed with ECT. Prior to ECT, the following workup was performed: cervical spine X-ray, medical clearance, and anesthesiology clearance. The patient was also given appropriate education regarding ECT treatment and agreed to informed consent.

ECT treatment was initiated on May 13, 2009. ECT parameters were as follows: charge 317 mC, energy 55.8 joules, dynamic impedance 220 Ohms, frequency 60 Hertz, duration 3 seconds, pulse width .6 msec, and current 800 mA with bilateral electrode placement. The patient experienced tonic clonic seizure activity,
but the seizure duration became extremely prolonged. After 3 minutes of uninhibited seizure activity, the determination was quickly made that pharmacological intervention was required to treat the prolonged seizure activity. The anesthesiologist treated the patient in succession with midazolam 2 mg intravenously at 2-minute intervals followed by propofol 100 mg intravenously. Ultimately, the patient responded following 2 mg of intravenous lorazepam. The prolonged seizure duration was 10 minutes. The patient suffered no deleterious effect.

Due to the extremely serious nature of the prolonged seizure, a decision was made to discontinue lithium for the remainder of the ECT treatment protocol. Lithium was re-initiated at 900 mg/day on June 12, 2009, following successful course of 12 ECT treatments. The patient did not respond fully to psychopharmacology and the ECT cycle, so psychological testing was performed. The testing confirmed evidence of depression; however, there was a strong correlation with schizoid personality disorder. This personality disorder probably played a role in his treatment response.

CASE 2

The patient is a 31-year-old man with a long history of psychiatric illness and numerous hospitalizations who has been followed at Mount Sinai School of Medicine. He was transferred from Mount Sinai to Elmhurst Hospital Center.

Upon admission to the Comprehensive Psychiatric Emergency Program the patient was complaining of what he initially described as racing and disorganized thoughts. As per patient report, he had been treated with a variety of antidepressants and adjunctive agents. He also described being involved in experimental protocols with non–US Food and Drug Administration-approved antidepressants as well as ketamine at Mount Sinai School of Medicine, with only marginal clinical improvement. After discussion with the patient and in consultation with his treating psychiatrist, the patient agreed to a trial of ECT. The first treatment was done on October 28, 2009. The patient had been started on lithium on September 8, 2009, which he willingly agreed to take. His blood levels of lithium ranged from 0.42 meq/L to 0.45 meq/L during the course of ECT therapy. After the first session of ECT, the patient had no adverse effects secondary to his being treated with lithium. The patient had a series of eight treatments, with the last one being performed at maximum energy (charge 576 mC, energy 117 joules, frequency 60 Hertz, duration 6 seconds, pulse width 1.0 msec, and current 800 mA with bilateral electrode placement). The patient had an excellent response to ECT with a remission of his depressive symptoms.

DISCUSSION

Lithium is a very useful medication in psychiatry, but it is a medication that must be carefully monitored. Above therapeutic levels, the patient may suffer confusional states, and this can happen even at normal lithium levels. There is a paucity of clinical studies to guide the clinician in how to proceed when considering the combination of lithium and ECT. The American Psychiatric Association guidelines recommend that lithium and ECT not be used in conjunction, but these guidelines were last updated 11 years ago. The British guidelines from 2006 embrace the use of lithium and anticonvulsants combined with ECT.

Penney et al reviewed the concurrent and simultaneous administration of ECT and lithium and concluded that those patients treated in combination had a greater chance of suffering confusion and some complications, but the length of stay was not prolonged. They conclude by stating that guidelines should be taken into consideration but there is no absolute contraindication to using the combined modality.

Milstein and Small also reviewed the subject and concluded that lithium can interact with anesthesia and with ECT, resulting in organic brain syndromes. They recommend that the combination of lithium and ECT be avoided.

Stewart wrote about a case report of maintenance ECT and lithium that was described as safe and effective without any evidence of adverse effects. The occurrence of adverse events in two articles explored the question of negative interaction between lithium and ECT. This study reviewed 31 cases of patients who received lithium and ECT concurrently compared with a control group of 135 who received ECT only. In this study, there was no difference in groups. Consequently, in patients who can benefit from the combination, there should be no concern in using the modality.

Rudorfer et al looked at the pharmacokinetic and pharmacodynamic interactions. As the significant information on combined lithium and ECT largely consists of case
reports and prospective controlled trials, it is difficult to postulate the mechanism of possible toxicity. In this study, the major considerations were the drug-drug interactions between lithium and ECT premedications. In addition, changes in lithium concentration and the possibility for potentiating the effects of anesthetic agents and neuromuscular blockade agents were examined. There is little evidence that lithium prolongs the action of succinylcholine; reduced serum cholinesterase activity is most likely responsible.

Martin and Kramer reviewed a series of 17 patients treated with ECT and lithium and they found no abnormal parameters and indicated no concerns regarding the simultaneous administration of ECT and lithium.

Lippmann and Tao reviewed the literature and presented a case report as well. The case described a patient who received 14 inpatient and more than 70 outpatient ECT treatments over 4 years while concurrent lithium was being administered. Consequently, the authors indicate that concurrent lithium and ECT may be utilized in appropriate cases.

Mukherjee reviewed the subject of ECT and lithium from the perspective of a therapeutic advantage or possible adverse affects. He concentrated on a discussion of the central nervous system effects of lithium and ECT with concerns about confusion and incoherent speech.

Gupta et al described a case as well as conducting a brief review of the literature. In the patient’s treatment, lithium was withheld during the active phase of treatment but was then restarted during the maintenance phase. The patient suffered no adverse events such as prolonged seizures or delirium or memory loss. Gupta concluded that there are many conflicting opinions regarding the use of lithium and ECT but that it might be considered an alternative strategy.

Naguib and Koornt reviewed psychotropics, anaesthetics, and ECT and came to the conclusion that there is a good deal of data that raises questions about the safety of lithium and ECT; however, there does not seem to be an absolute contraindication.

CONCLUSION

Patients who are treated with ECT are quite ill and often are taking a number of adjunctive medications to treat their mood symptoms. There is certainly a significant database to consider in making the decision to combine lithium and ECT. Ultimately, one must decide based upon the severity of the patient’s symptoms and the expected risk of continuing or withholding lithium and other mood stabilizers. Both ECT and lithium can be life-saving alone and sometimes together.

As the British and American data are often contradictory, the decision to continue lithium is indeed complicated and the decision as to how to proceed may be based upon clinical decisions and judgment. We feel that ECT and lithium is not contraindicated but the concomitant use must be carefully considered.

REFERENCES