Delirium has been described as a potential complication of concurrent lithium and electroconvulsive therapy (ECT) for depression, in association with a range of serum lithium levels. Although debate persists about the safety of continuing previously established lithium therapy during a course of ECT for mood symptoms, withholding lithium for 24 hours before administering ECT and measuring the serum lithium level before ECT were found to decrease the risk of post-ECT neurocognitive effects.

We have found that the conventional practice of holding lithium for 24 hours before ECT might need to be re-evaluated in geriatric patients, as the following case demonstrates. Only 24 hours of holding lithium therapy might result in a lithium level sufficient to contribute to delirium after ECT.

**CASE REPORT**

An older woman with recurrent unipolar psychotic depression

Mrs. A, age 81, was admitted to the hospital with a 1-week history of depressed mood, anhedonia, insomnia, anergia, anorexia, and nihilistic somatic delusions that her organs were “rotting and shutting down.” Treatment included nortriptyline, 40 mg/d; lithium, 150 mg/d; and haloperidol, 0.5 mg/d. Her serum lithium level was 0.3 mEq/L (reference range, 0.6 to 1.2 mEq/L); the serum nortriptyline level was 68 ng/mL (reference range, 50 to 150 ng/mL). CT of the head and an electrocardiogram were unremarkable.

A twice-weekly course of ECT was initiated. The day before Treatment 1 of ECT, the serum lithium level (drawn 12 hours after the last dose) was 0.4 mEq/L. Lithium was withheld 24 hours before ECT; nortriptyline and haloperidol were continued at prescribed dosages.

Right unilateral stimulation was used at 50%/mC energy (Thymatron DG, with methohexitol anesthesia, and succinylcholine for muscle relaxation). Seizure duration, measured by EEG, was 57 seconds.

Mrs. A developed postictal delirium after the first 2 ECT sessions. The serum lithium level was unchanged. Subsequently, lithium treatment was discontinued and ECT was continued; once lithium was stopped, delirium resolved. ECT sessions 3 and 4 were uneventful, with no post-treatment delirium. Seizure duration for Treatment 4 was 58 seconds. She started breathing easily after all ECT sessions.

After Treatment 4, Mrs. A experienced full remission of depressive and psychotic symptoms. Repeat CT of head, after Treatment 4, was unchanged from baseline.

**What is the role of lithium?**

Mrs. A did not exhibit typical signs of lithium intoxication (diarrhea, vomiting, tremor). Notably, lithium has an intrinsic anticholinergic activity; concurrent nortriptyline, a secondary amine tricyclic antidepressant with fewer anticholinergic side effects than other tricyclics, could precipitate delirium in a vulnerable patient secondary to excessive cumulative anticholinergic exposure.

No prolonged time-to-respiration or time-to-awakening occurred during treatments in which concurrent lithium and ECT were used; seizure duration with and without concurrent lithium was relatively similar.

There are potential complications of concurrent use of lithium and ECT:

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• prolongation of the duration of muscle paralysis and apnea induced by commonly used neuromuscular-blocking agents (eg, succinylcholine)
• post-ECT cognitive disturbance.\textsuperscript{1,3,4}

There is debate about the safety of continuing lithium during, or in close proximity to, ECT. In a case series of 12 patients who underwent combined lithium therapy and ECT, the authors concluded that this combination can be safe, regardless of age, as long as appropriate clinical monitoring is provided.\textsuperscript{4} In Mrs. A’s case, once post-ECT delirium was noted, lithium was discontinued for subsequent ECT sessions.

Because further ECT was uneventful without lithium, and no other clear acute cause of delirium could be identified, we concluded that lithium likely played a role in Mrs. A’s delirium. Notably, nortriptyline had been continued, suggesting that the degree of anticholinergic blockade provided by nortriptyline was insufficient to provoke delirium post-ECT in the absence of potentiation of this effect, as it had been when lithium also was used initially.

Guidelines for dosing and serum lithium concentrations in geriatric patients are not well-established; the current traditional range of 0.6 to 1.2 mEq/L, is too high for geriatric patients and can result in episodes of lithium toxicity, including delirium.\textsuperscript{5} Although our patient’s lithium level was below the reference range for all patients, a level of 0.3 mEq/L can be considered at the low end of the reference range for geriatric patients.\textsuperscript{5} Inasmuch as the lithium-assisted post-ECT delirium could represent a clinical sign of lithium toxicity, perhaps even a subtherapeutic level in a certain patient could be paradoxically “toxic.”

Although the serum lithium level in our patient remained below the toxic level for the general population (>1.5 mEq/L), delirium in a geriatric patient could result from:
• age-related changes in the pharmacokinetics of lithium, a water-soluble drug; these changes reduce renal clearance of the drug and extend plasma elimination half-life of a single dose to 36 hours, with the result that lithium remains in the body longer and necessitating a lower dosage (ie, a dosage that yields a serum level of approximately 0.5 mEq/L)
• the CNS tissue concentration of lithium, which can be high even though the serum level is not toxic
• an age-related increase in blood-brain barrier permeability, making the barrier more porous for drugs
• changes in blood-brain barrier permeability by post-ECT biochemical induction, with subsequent increased drug availability in the CNS.\textsuperscript{5,6}

**What we recommend**

Possible interactions between lithium and ECT that lead to ECT-associated delirium need further elucidation, but discontinuing lithium during the course of ECT in a geriatric patient warrants your consideration. Following a safe interval after the last ECT session, lithium likely can be safely re-introduced 1) if there is clinical need and 2) as long as clinical surveillance for cognitive side effects is provided—especially if ECT will need to be reconsidered in the future.

Two additional considerations:
• Actively reassess lithium dosing in all geriatric psychiatric patients, especially those with renal insufficiency and other systemic metabolic considerations.
• Actively examine the use of all other anticholinergic agents in the course of evaluating a patient’s candidacy for ECT.

**References**

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