Thyroid Storm Following Lithium Removal via Hemodialysis: A Case Report

To the Editor: Lithium has been known to interfere with thyroid function by causing hypothyroidism and, less frequently, hyperthyroidism. Lithium removal–induced thyrotoxicosis, on the other hand, has rarely been reported in the literature. This is the second documented case[1] to our knowledge of thyroid storm occurring following hemodialysis indicated for lithium toxicity. While this case was recently presented by Altieri et al,[2] concluding that lithium—rather than lithium removal—was the cause of thyroid storm, we wish to shine a different light by discussing how thyroid storm may occur following rapid removal of circulating lithium.

Case report. An 18-year-old white woman with a history of bipolar disorder and morbid obesity who had previously undergone a gastric sleeve procedure presented to the hospital with altered mental status. Admission vital signs were unremarkable except for tachycardia (110 bpm). She was found to be lithium toxic at 2.7 mmol/L and eventually required intubation and 2 courses of hemodialysis, after which the lithium level went down to 1.0 mmol/L.

The day after the second course of hemodialysis, the patient was found to be agitated, restless, disoriented, and unable to follow commands. Her vital signs were temperature: 40.2°C [104.4°F], heart rate: 145 bpm, and blood pressure: 188/115 mm Hg. Metoprolol, ibuprofen, acetaminophen, cooling blankets, ice, and cool intravenous fluid were initiated. A complete blood count, blood culture, and urine culture were obtained and were noncontributory; creatine phosphokinase and ammonia levels were unremarkable. Thyroid function tests showed depressed thyroid-stimulating hormone: 0.013 mIU/L, elevated T_4: 238 nmol/L, elevated free T_4: 40.0 pmol/L, and elevated T_3: 4.086 nmol/L levels. An endocrinology consultation confirmed the diagnosis of thyroid storm, and potassium iodide, dexamethasone, propranolol, and methimazole were administered. Her thyroid function levels and vital signs normalized within the next 2 days. Her hospital course was further complicated by aspiration pneumonia, urinary tract infection, and bacteremia. She was discharged 19 days after admission and continued on methimazole 10 mg daily. Results from a thyroid-stimulating immunoglobulin test and thyroid uptake and scan test done by an outpatient clinic were negative.

Lithium is known to cause hypothyroidism by inhibiting thyroid hormone synthesis and decreasing peripheral T_4 deiodination.[3] Although less common, lithium has also been reported to cause hyperthyroidism through various possible mechanisms: lithium-triggered autoimmunity, expansion of intrathyroidal iodine pool, release of thyroglobulin caused by damage of thyroid follicular cells, and coincidental hyperthyroidism.[4–8]

On the other hand, lithium removal–induced hyperthyroidism is rarely reported in the literature. Several cases[4,9–11] have described patients diagnosed with thyrotoxicosis 3 weeks to 6 months after discontinuation of lithium, with one case[4] involving a patient for whom lithium was merely decreased to one-third of its original dose. Only one documented case[1] has described thyroid storm following hemodialysis for lithium toxicity. Hemodialysis has been viewed as the treatment of choice for severe lithium toxicity, as it facilitates a 5-fold increase in lithium removal rate compared to renal clearance in a healthy subject.[12]

Several mechanisms may explain lithium removal–induced hyperthyroidism. One study[13] suggested that cessation of lithium could lead to transient glandular rebound and thyrotoxicosis as lithium's thyroid-inhibiting effect is lost. Alternatively, lowered serum lithium could simply serve to unmask underlying hyperthyroidism.[10] Furthermore, noncompliance with antithyroid medications is one of the most common causes of thyroid storm in hyperthyroid patients,[14] and, thus, fast removal of circulating lithium may have worked similarly in our patient to trigger thyroid storm.

This is the second documented case to our knowledge of thyroid storm manifesting after lithium removal via hemodialysis, illustrating the need for increased awareness of the possible occurrence of thyroid storm following rapid removal of circulating lithium.

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