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CASE REPORT

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Lithium Intoxication After Sleeve Gastrectomy: A Case Report and Differential Diagnosis

Zeliha DÖNMEZ[1], Şiirnaz KÜKÜRT[1], Gonca DOKUZ[1], Ozge KİLİC[1], Furkan COŞKUN[1], Erkan YARDIMCI[2], İsmet KIRPINAR[1]

[1]Department of Psychiatry, Bezmiâlem Vakıf University Faculty of Medicine, Istanbul, Türkiye
[2]Department of General Surgery, Bezmiâlem Vakıf University Faculty of Medicine, Istanbul, Türkiye

ABSTRACT

Bariatric surgery rates have been increasing in the treatment of obesity worldwide recently. In addition to many physical changes after bariatric surgery, the bioavailability of medications can also be significantly affected. In this article, we present a 51-year-old female patient diagnosed with lithium toxicity after sleeve gastrectomy surgery. The patient started to show gastrointestinal symptoms post-surgery after 37 days. She was initially followed up with the diagnosis of gastroenteritis and continued to use lithium. Subsequently, neurological symptoms were added, and she was diagnosed with lithium toxicity. During the toxicity treatment, elevated mood were also observed. We aimed to emphasize the importance of post-bariatric surgery follow-up for patients undergoing psychiatric treatments, especially those using lithium, focusing on both medication management and monitoring of clinical symptoms.

Keywords: bariatric surgery, bipolar disorder, lithium toxicity

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INTRODUCTION

Obesity has been a significant public health problem worldwide. The global obesity [body mass index (BMI) greater than or equal to 30] and overweight [BMI between 25.0 and 29.9 kg/m^2] rates were reported as 13 % and 39 %, respectively, in adults (1). Individuals with (BMI) >40 kg/m^2 or a BMI >35 kg/m^2 with obesity-related diseases and who have unsuccessful nonoperative weight loss attempts can be candidates for bariatric surgery (2). A large sample of database reports revealed that the obesity prevalence among people with bipolar disorder (BD) (41.4%) was significantly higher than in the general population (27.1%) (3). Obesity may result in poorer outcomes in patients with bipolar disorders, including medical comorbidity and severity of illness (4). Besides, psychiatric medications, such as lithium (Li), second-generation antipsychotics, and antidepressants may increase appetite and blood glucose levels, contributing to weight gain and obesity in patients (4). Li has been one of the first-line treatment options for bipolar disorder and has a narrow therapeutic range of 0.6 to 1.2 mmol/L, with levels >1.5 mmol/L considered toxic (5). Li is known to be well absorbed in the intestinal tract and is mostly excreted by the renal system (5). Due to its narrow therapeutic index, it is crucial to be aware of the changes in pharmacokinetics after bariatric surgery.

Following bariatric surgery, patients lose a significant amount of weight, resulting in a decrease in total body water, which decreases renal blood flow and glomerular filtration rate (GFR). Since Li is excreted exclusively by the kidneys at a rate of 20% to 30% of GFR, a decreased GFR can lead to Li toxicity. Furthermore, decreased food intake and weight loss due to the surgery lead to dehydration and may gradually increase Li toxicity (6–8).

Another mechanism for Roux-en-Y and sleeve gastrectomy procedures is to increase gastric pH, which may actually increase the deprotonated form of Li and lead to increased absorption (6). Due to same physiological changes, it is possible to have increased side effects of psychotropic drugs. While the pharmacokinetics of some drugs, such as venlafaxine, remain constant, the early and late pharmacokinetics of other drugs may vary (9).

Highlights

- **Bariatric surgery increases the risk of lithium intoxication.**
- **Lithium blood level monitoring is crucial after bariatric surgery.**
- **Educating patients and caregivers about lithium intoxication is essential.**
- **When lithium levels are below toxic levels, differential diagnosis gets challenging.**

Correspondence Address: Zeliha Dönmez, Department of Psychiatry, Bezmiâlem Vakıf University Faculty of Medicine, Istanbul, Türkiye • **E-mail:** zelihaulasli@hotmail.com
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Here, we present a case of Li toxicity after laparoscopic sleeve gastrectomy and discuss the processes leading to Li toxicity following bariatric surgery.

CASE REPORT

A 51-year-old female patient with a bipolar disorder diagnosis for 18 years was hospitalized in the general surgery inpatient clinic with the symptoms of gastroenteritis. She was referred to our psychiatric consultation service by general surgeons with symptoms of confusion, disorientation, hyperesthesia, dysarthria, ataxia, chorea, and athetosis. It was learned that she had undergone laparoscopic sleeve gastrectomy surgery 37 days ago and had been followed up by the general surgery outpatient clinic till the start of the signs of gastroenteritis. Her medical history consisted of morbid obesity, type 2 diabetes mellitus, hypothyroidism, hypercholesterolemia, hyperlipidemia, and essential hypertension.

Her episodes were remitted under 1200 mg/day of Li, 500 mg/day of valproate, and 400 mg/day of quetiapine as she failed to lose weight despite implementing a diet and recommended lifestyle changes, she underwent bariatric surgery. At the time of the surgery, her Li level was found to be 0.622 mmol/L and her valproate level was 12.18 mg/L. Before the bariatric surgery, all of her psychiatric medications were stopped for a day and started postoperatively one day later with 400 mg/day of quetiapine, 2000 mg/day of valproate, and 300 mg/day of Li. After two days, she started to take Li at 1200 mg/day although she was advised to take it at 600 mg/day. She was followed up by general surgery on day 10 post-discharge and did not show any symptoms or have any complaints.

After a month of surgery, she had lost 11 kg (from 106 kg to 95 kg). However, she started to feel fatigue and nausea, and she had diarrhea for 3 days. Her routine blood tests showed hypovolemia, and GFR was low (78 ml/min/1.73 m^2). The physician suggested investigating further in the inpatient service, but she did not consent to hospitalization and went home.

Four days later, she was admitted to another hospital's emergency room with persistent, secretory diarrhea and vomiting. She reported having a metallic taste and therefore stopped drinking water. Her serum valproate level was 54.4 mg/L and her Li level was 2.85 mmol/L. The patient and her relatives did not consent to hospitalization for the management of Li intoxication. She received 0.9% serum isotonic (1000 cc per day) for three days at home. Subsequently, she presented to the emergency service in our hospital with nausea, vomiting, diarrhea, right lower quadrant pain, fever, and slight tremors. Aggressive intravenous hydration (3000 cc) was initiated, and her Li levels dropped to 0.947 mmol/L after the hydration treatment. The patient was admitted to the general surgery inpatient service to further examine probable gastroenteritis, with her blood tests showing Li levels below 1 mmol/L, with her blood work showing, leukocytosis and high C-reactive protein (CRP).

Although the patient received IV hydration (1000 cc/day) and antibiotics, her symptoms did not remit, and later that day she started showing signs of confusion, disorientation, dysarthria, hyperesthesia, ataxia, chorea, and athetosis. Her blood Li level was 1.154 mmol/L. The patient was admitted to the intensive care unit (ICU) due to severe dehydration and an acute kidney injury. All medications were stopped. It was started to giving her intramuscular biperiden injection, intravenous fluids (0.90% w/v of NaCl), pheniramine, and lorazepam. Her Li levels were routinely checked every six hours. She stayed agitated and disoriented for five days despite serum Li levels being in the therapeutic range (0.82 to 1.07 mmol/L maximum). The nephrology department found no indication for hemodialysis due to normal Li levels. On the sixth day, her blood Li levels dropped to 0.399 mmol/L. In her psychiatric examination, she resumed her cooperation and orientation abilities. Her movement anomalies and dysarthria subsided; her speech became more fluent and logical. However, her thought content and attitude were grandiose, and she had a labile affect. Olanzapine 5 mg/day routinely and lorazepam 1 mg/day on a needed basis was initiated. After this treatment, her labile affect became calmer, and her sleep improved. The next day, she was discharged from the ICU and admitted to the general surgery inpatient service, however, her emotional lability became more apparent, she cried and became dull all of a sudden besides, restless, sleepless, and delusional. Olanzapine was titrated to 10 mg per day considering her elevated mood symptoms. Since the patient was no longer in a life-threatening condition, she was transported to a secure psychiatric in-patient unit to be treated under close observation. Her Li level was 0.206 mmol/L before the discharge.

DISCUSSION

We presented a female patient who continued taking Li doses prescribed according to her psychiatric status before a bariatric surgery operation and had undergone a post-operative Li intoxication. The presenting symptoms during the consultation to psychiatry were neuropsychiatric in nature however were likely to be attributed to a possible gastroenteritis.

It was understood that the symptoms of lithium intoxication started before. The patient reported nausea, vomiting, metallic taste in mouth, fatigue, and diarrhea, which were the first symptoms of Li intoxication. (7). A metallic taste in her mouth due to Li intoxication had restricted water intake and contributed to intoxication in our case.

It should be noted that gastrointestinal system symptoms related to acute Li toxicity can be seen even at therapeutic blood Li levels and mimic gastroenteritis or other post-operative surgical complications of bariatric surgery such as infections, dumping syndrome, malnutrition, vitamin or iron deficiency, and chronic nausea and vomiting. Patients may be asymptomatic or have mild symptoms, including gastrointestinal symptoms, at the beginning of toxication; however, if these symptoms cannot be recognized, they may progress to neuropsychiatric symptoms and result in irreversible damage if the toxication prolongs. Additionally, as in our case, neurotoxic symptoms may not disappear immediately even if the blood Li level drops below the toxic level, as Li accumulates in nerve cells and is released slowly (10–12).

There are thirteen Li toxicity cases reported following sleeve gastrectomy and Roux-en-Y gastric bypass surgery in the literature (13). Our case differs from those that gastroenteritis was first diagnosed and the subsequent severe neurological symptoms occurred after the serum lithium level dropped to 1.15 mmol/L.

It was observed that the male/female ratio of the patients was 1/3. This data seems consistent with the fact that 72–78% of candidates applying for bariatric surgery are women (14). Li intoxication was reported within seven days to six months after bariatric surgery in all cases, while five of these were reported within the first 37 postoperative days. Considering the longer duration until the onset of symptoms reported, the pharmacokinetics of Li also appear to change in the late periods, possibly due to adaptive changes that occur over time (10). Despite these challenges, there is currently no established guideline for clinical Li monitoring for the perioperative period in bariatric surgery. In light of this case and the literature, we suggested following recommendations for clinicians in patients using Li perioperatively 1) Collaboration between a bariatric surgeon, a psychiatrist, a primary care physician in the pre- and postoperative phases 2) Gradually reducing the dose by 30–70% one week prior to surgery and titrating based on therapeutic drug monitoring [TDM] 3) Considering switching to extended-release. 4) Not changing to liquid formulation without TDM 4) Educating the patient and

caregivers preoperatively on the importance of drinking at least 2 or 3 liters of water per day 5) Educating patients and caregivers about early symptoms of lithium intoxication 6) Postoperatively, weekly assessments of the patient's Li level and GFR for 6 weeks, then every two weeks until six months and then monthly levels should be obtained until one year post surgery (11, 12. 15).

Informed Consent: Informed consent was obtained from both the patient and the patient's relative.

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Conflict of Interest: The authors declared that there is no conflict of interest.

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