

Case Study of Lithium Toxicity Arising In A 49 Year Old Female 5 Years After Sleeve Gastrectomy

M.J. Yoo¹, A. Dhar¹, K. Vaddadi¹

¹Monash Health, Psychiatry, Melbourne, Australia



Objectives

To discuss a case of lithium toxicity, 5 years after sleeve gastrectomy

Background

Bariatric surgery is performed with increasing frequency in the western world. It is approximated that at least 4% of patients undergoing bariatric surgery have a known diagnosis of Bipolar Affective Disorder (BPAD) ¹. Lithium is a mainstay first-line therapy for treatment of BPAD, and due to its narrow therapeutic index, comprehensive knowledge of its pharmacokinetics is imperative for safe prescribing². Current literature suggests that Roux-en-Y Gastric Bypass (RYGB) may alter the pharmacokinetics of lithium, contributing to lithium toxicity³⁻⁷. However, RYGB is only one type of bariatric surgery, with sleeve gastrectomy rapidly overtaking RYGB as the bariatric procedure of choice in an increasing number of countries across the world⁸.

Despite the increasing prevalence of sleeve gastrectomy worldwide, there are only two case reports published to date that describe lithium toxicity following sleeve gastrectomy⁹⁻¹⁰. Furthermore, these case studies only consider lithium toxicity in the short-term post-operative period, and there are no reports to date that document lithium toxicity occurring several years after sleeve gastrectomy. Therefore, this case report addresses a gap in current literature, describing an occurrence of lithium toxicity occurring 5 years after sleeve gastrectomy.

Case Study

A 49 year old female with BPAD presented an emergency department following a tonic-clonic seizure. Regular medications included immediate-release lithium carbonate 750mg daily. She had undergone sleeve gastrectomy 5 years ago. On clinical examination, hydration status was adequate, and there were no neurological sequelae with the exception of post-ictal drowsiness.

Blood tests demonstrated normal levels of serum urea and creatinine, and normal eGFR. Serum lithium level was high; 1.22mmol/L (therapeutic range 0.60-1.20mmol/L). All other blood tests were unremarkable. CT Brain was also unremarkable, and subsequent EEG did not demonstrate any underlying cause for seizure disorder.

All other investigations being normal with the exception of high serum lithium level, lithium toxicity was determined as the most likely cause of the seizure.

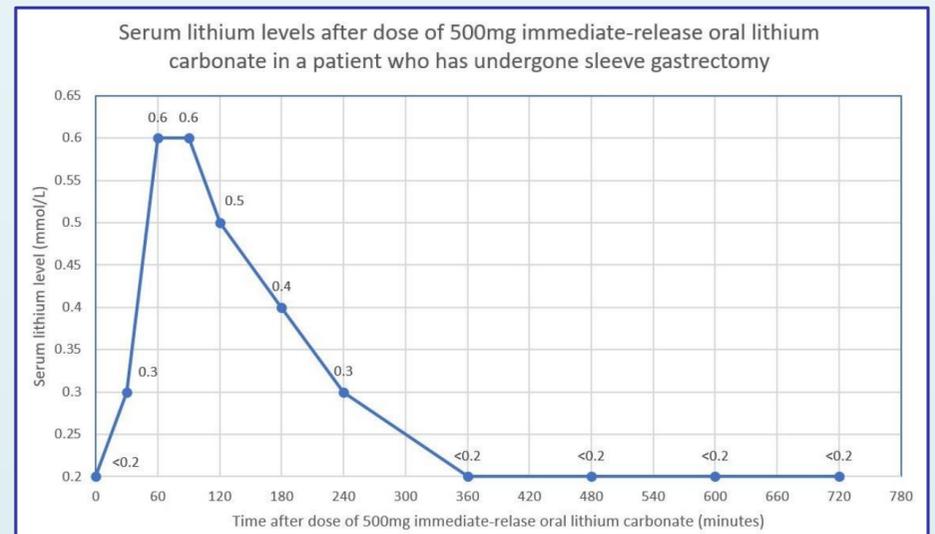
Method

Lithium was ceased for 4 days. Immediate-release lithium carbonate 500mg (2 tablets of Lithicarb® 250mg) was then orally administered. Serial serum lithium levels were obtained, via forearm intravenous cannula, at 0, 30, 60, 90, 120, 180, 240, 300, 360, 480, 600, and 720 minutes respectively following administration of the oral dose. A standardised method of serum drug analysis was used for all the blood samples to determine serum levels of lithium.

Results

Serum lithium levels peaked 60-90min after oral administration, at 0.6mmol/L. Levels decreased to <0.2mmol/L at 360min. [see Figure 1]

Figure 1



Discussion

Bariatric surgery is known to alter gastrointestinal tract anatomy and physiology, thereby altering drug pharmacokinetics⁴. This is well documented in patients following RYGB, in which increased gastrointestinal tract pH, altered gastrointestinal motility, and decreased gastrointestinal transit time are suggested potential mechanisms by which drug absorption may be altered in a post-RYGB patient, contributing to lithium toxicity³⁻⁷.

Similar mechanisms are implicated in the two case studies that discuss lithium toxicity in the short-term post-operative period following sleeve gastrectomy⁹⁻¹⁰. However, in the short-term post-operative period, it is difficult to determine to what extent lithium toxicity is a consequence of alterations in gastrointestinal anatomy and physiology specific to sleeve gastrectomy surgery, and to what extent lithium toxicity may be a consequence of peri-operative physiological changes that can occur with any major surgical procedure. Specifically, hydration status, fluid shift, and impaired renal function may contribute to high levels of lithium in the short-term peri-operative period. Therefore, this case study is pertinent, as it describes lithium toxicity without apparent dehydration or impaired renal function, outside of the peri-operative time frame; 5 years after sleeve gastrectomy. The observed curve of serum lithium level against time follows a similar pattern to those seen in patients without sleeve gastrectomy, but further research is required to determine whether it reflects a statistically significant deviance from expected rate of absorption and peak serum lithium level compared to control.

References

1. Kalarchian, M.A., Marcus, M.D., Levine, M.D., Courcoulas, A.P., Pilkonis, P.A., Ringham, R.M., Soulakova, J.N., Weissfeld, L.A., & Rofey, D.L. (2007). Psychiatric disorders among bariatric surgery candidates: Relationship to obesity and functional health status. *American Journal of Psychiatry*, 154, 328-332. doi:10.1176/ajp.2007.164.2.328
2. Grandjean, E., & Aubry, A.M. (2009). Lithium: Updated human knowledge using an evidence-based approach: Part I: Clinical efficacy in bipolar disorder. *CNS Drugs*, 23(3), 225-240. doi:10.2165/00023210-200923030-00004
3. Walsh, K., & Volling, J. (2014). Lithium toxicity following Roux-en-Y gastric bypass. *Bariatric Surgical Practice and Patient Care*, 9(2), 77-80. doi:10.1089/bari.2014.0007
4. Musfeldt, D., Levinson, A., Nykiel, J., & Carino, G. (2016). Lithium toxicity after Roux-en-Y bariatric surgery. *BMJ Case Reports*. doi:10.1136/bcr-2015-214056
5. Tripp, A.C. (2011). Lithium toxicity after Roux-en-Y gastric bypass surgery. *Journal of Clinical Psychopharmacology*, 31(2), 261-262. doi:10.1097/JCP.0b013e318210b203
6. Bingham, K.S., Thoma, J., Hawa, R., & Sockalingam, S. (2016). Perioperative lithium use in bariatric surgery: A case series and literature review. *Psychosomatics*, 57(6), 638-644. doi:10.1016/j.psych.2016.07.001
7. Seaman, J.S., Bower, S.P., Dixon, P., & Schindler, L. (2005). Dissolution of common psychiatric medications in a Roux-en-Y gastric bypass model. *Psychosomatics*, 46(3), 250-253. doi:10.1176/appi.psy.46.3.250
8. Himpens, J., Ramos, A., Welbourn, R., Dixon, J., Kinsman, R., & Walton P. (2018). Fourth IFSO Global Registry Report. Retrieved from <https://www.ifso.com/pdf/4th-ifso-global-registry-report-last-2018.pdf>
9. Dahan, A., Porat, D., Azran, C., Mualem, Y., Sakran, N., & Abu-Abaid, S. (2019). Lithium toxicity with severe bradycardia post sleeve gastrectomy: A case report and review of the literature. *Obesity Surgery*, 29, 735-738. doi:10.1007/s11695-018-3597-x
10. Alam, A., Raouf, S., & Recio, F.O. (2016). Lithium toxicity following vertical sleeve gastrectomy: A case report. *Clinical Psychopharmacology and Neuroscience*, 14(3), 318-320. doi:10.9758/cpn.2016.14.3.318
11. Carmil, A., Omri, W., Moran, Z., Fine-Shamir, N., Shaked, G., Czeiger, D., Sebbag, G., Kister, O., Langguth, P., & Dahan, A. (2016). Oral drug therapy following bariatric surgery: An overview of fundamentals, literature and clinical recommendations. *Obesity Reviews*, 17(11), 1050-1066. doi:10.1111/obr.12434