ISSN 2063-5346

LITHIUM AS A FACTOR OF BOTH THYROID AND PARATHYROID DISORDERS – A CASE REPORT

Authors: Klodi Poshi[1,2], Etleva Rustami. [1]Adela Haxhiraj[2]

Article History: Received: 01.02.2023 Revised: 07.03.2023 Accepted: 10.04.2023

Abstract

Lithium is among the most used medications in the treatment of bipolar disorder, in preventing depressive and manic episodes, as well as reducing the risk of suicide in the population with this disorder.We report a case where the endocrine dysfunction of hypothyroidism and hyperparathyroidism were diagnosed in parallel.The 54-year-old female patient was treated for bipolar disorder with Lithium for more than 18 years. For 17 years, she had not been subjected to other biochemical controls. Recently the patient complained of fatigue, dizziness, and headache.. Due to the long-term use of lithium, she was asked to measure her level of lithium in the blood, which resulted in hight level 3.23 mEq/L. Biochemical balance, which resulted in TSH 37 mIU/L and PTH 126 pg/mL. In patients with long-term treatment with Lithium, the function of the thyroid gland, parathyroid gland and calcium metabolism should be periodically monitored .

Key words:Lithium.Parathormon.Hypothyroid.

[1]Faculty of Technical Medical Sciences, University of Medicine Tirana, Albania.

[2] Department of Endocrinology, Diabetes and Metabolic Disease, University Medical Center ``Mother Teresa``, Tirana, Albania.

Co -author: klodiposhi@yahoo.com

DOI:10.31838/ecb/2023.12.s1-B.311

Introduction

Lithium is the most long-term drug used in the treatment of bipolar disorder, both in preventing manic episodes and in reducing the risk of suicide. Through its action at the level of the prefrontal cortex, hippocampus and amygdale, lithium reduces the secretion of excitatory neurotransmitters such as dopamine and glutamate and promotes the release of the GABA inhibitor.[1] The interaction of lithium at the cellular level serves mostly to maintain neuropsychiatric and emotional balance. In long-term use, due to its effect in reducing stress, lithium is considered neuroprotective and neurotrophic.[2] Despite the positive effects at the cerebral level, the effects of lithium extend even further, affecting peripheral tissues such as the thyroid and parathyroid. By acting directly on the thyroid and indirectly on the hypothalamic and pituitary level, lithium favors hypothyroidism and the formation of goiter.[3] In addition, this drug plays a role in calcium metabolism, causing hypercalcemia and hyperparathyroidism.[4] The side effects, although known, are not always concomitant during long-term treatment with lithium. We present a case where metabolic disorders are simultaneously diagnosed during the use of maximum doses of lithium.

Case Report

The patient, a 54-year-old female, presented to the service with complaints of fatigue, dizziness, headache, and episodes of vomiting. For over 15 years, she was treated with Lithium and Olanzapine for the diagnosis of bipolar disorder. In the same number of years, she had received medication regularly, she had been evaluated in terms of behavior status, but her other biochemical parameters had not been checked. Due to the constant use of lithium, she was asked to measure her level of lithium in the blood, which resulted in toxic values, 3.23 mEq/L. She was requested a complete biochemical balance as the patient had not performed it before. The results of kidney, thyroid and parathyroid function are summarized in table 1.

After hypothyroidism and hyperparathyroidism were diagnosed, the patient was discontinued from lithium and was left on Olanzapine therapy alone. Levothyroxine therapy was started at the same time. To complete the framework and to verify the long-term side effects of lithium, imaging evaluation of the thyroid gland and parathyroids, as well as other complementary factors of calcium metabolism, were also requested.

Discussion

Lithium is among the most widely used anti-manic drugs. Thanks to the intracellular action, at the level of secondary messengers, the effect of lithium extends to multiple organs and multi systemic dimensions.[5] Two of the most affected functions are the thyroid and parathyroid. Cases of alteration of thyroid hormones due to the use of lithium are known in the literature.[6] This metal acts on almost all links of the synthesis and release of thyroid hormones. It inhibits the capture of iodine by the thyrocytes, its organization and pairing, as well as alters the structure of thyroglobulin. It also changes the structure of peripheral receptors and tissue deiodinases. All these effects result in a high risk for hypothyroidism and the development of goiter. As seen in the published cases, also in our case, the prolonged and uncontrolled use of the dose has caused dysfunction and raises the need for the start of hormone replacement therapy.[7] Unlike some other cases, our patient also developed hyperparathyroidism in parallel. At the parathyroid level, lithium increases the level of PTH by increasing the threshold of sensitivity of the calcium receptor (CSR) through the feedback mechanism that controls PTH secretion.[8] Also, it inhibits glycogen synthesis kinase-3b (GSK-3B) which accelerates the production of PTH

and can favor morphological changes leading to hyperplasia or the formation of adenomas. Clinical cases that have developed hyperparathyroidism should be investigated to see the degree of calcium metabolism disorder as well as the structural changes that may follow.[9] Although lithium discontinuation is necessary in case of hormonal disorder, replacement therapy and dynamic monitoring are necessary therapeutic steps. Structural alterations of the parathyroid glands caused by lithium require surgical treatment.

Conclusion

The role of lithium in the neuropsychiatric field has been known for a long time and is still widely used today. Thanks to the inhibition of neurotransmitters and the reduction of cellular stress, lithium is indicated in the management of cerebral excitatory situations. However, the long-term use of lithium requires periodic control of its blood levels in order to avoid toxicity, as well as the evaluation of organs potentially affected by it. It is recommended to measure the parameters before starting the therapy, as well as periodically during the therapy.

References

1. Malhi, G. S., Tanious, M., Das, P., Coulston, C. M., & Berk, M. (2013). Potential mechanisms of action of lithium in bipolar disorder: Current understanding. CNS drugs, 27, 135-153.
2. Machado-Vieira, R. (2018). Lithium, stress, and resilience in bipolar disorder: deciphering this key homeostatic synaptic plasticity regulator. Journal of Affective Disorders, 233, 92-99.
3. Lazarus, J. H. (1998). The effects of lithium therapy on thyroid and thyrotropin-releasing hormone. Thyroid, 8(10), 909-913.
4. Christiansen, C., Baastrup, P. C., & Transbøl, I. (1980). Development of 'primary'hyperparathyroidism during lithium therapy: longitudinal study. Neuropsychobiology, 6(5), 280-283.
5. Gitlin, M. (2016). Lithium side effects and toxicity: prevalence and management strategies. International journal of bipolar disorders, 4(1), 1-10.
6. Kibirige, D., Luzinda, K., & Ssekitoleko, R. (2013). Spectrum of lithium induced thyroid abnormalities: a current perspective. Thyroid Research, 6(1), 1-5.
7. Aksoy, S., Kilickap, S., & Erman, M. (2006). Lithium-associated hypothyroidism and thyroid papillary carcinoma: a case report. Southern medical journal, 99(3), 279-282.
8. Davis, B. M., Pfefferbaum, A., Krutzik, S., & Davis, K. L. (1981). Lithium's effect on parathyroid hormone. The American Journal of Psychiatry.
9. Naramala, S., Dalal, H., Adapa, S., Hassan, A., & Konala, V. M. (2019). Lithium-induced hyperparathyroidism and hypercalcemia. Cureus, 11(5).

Tables

Table 1 Blood Tests Results

Parameter	Value	Normal Range
Lithium	3.23	0.6 -1.2 mEq/L
TSH	37	0.4 - 4.04 mIU/L
PTH (parathyroid hormone)	126	15 - 65 pg/mL
Urea		6 – 24 mg/dL
Creatinine		0.6 - 1.1 mg/dL
Calcium		8.5 - 10.2 mg/dL