Case Report

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Lithium Induced Bradycardia.

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Abstract

Lithium (Li) remains one of the cornerstone drugs in both acute and maintenance therapy for bipolar illness. In addition, Li is a drug with a narrow therapeutic range. Intoxication may develop as a result of deterioration in kidney functions in patients using Li chronically. In our case, symptomatic bradycardia developed during the follow-up of the patient who developed acute renal failure after coronary angiography. We will present a case which was evaluated as Li intoxication and the heart rate returned to normal limits after hemodialysis.

Introduction

Lithium (Li) remains one of the cornerstone drugs in both acute and maintenance therapy for bipolar illness(Malhi et al., 2017). In addition, Li is a drug with a narrow therapeutic range and requires regular monitoring of organ functions such as kidney and thyroid in patients using this drug due to its systemic side effects (Truedson et al., 2022). Cardiac functions may be affected secondary to Li intoxication. In this case, we presented a case of symptomatic sinus bradycardia secondary to Li intoxication.

Case Report

A 48-year-old male patient with a known diagnosis of bipolar disorder was admitted to another hospital's internal medicine department with the complaint of dyspnea for 3 years. The patient had been using Aripiprazole 10 mg 1x1 and Li 300 mg 1x1 for about 3 years due to current bipolar disorder. Pulmonary edema was seen in the Thorax Computed Tomography of the patient and the patient was referred to the cardiology department. Transthoracic echocardiography (TTE) performed on the patient revealed an ejection fraction of 40% and moderate tricuspid and mitral valve insufficiency. Coronary angiography (CAG) was performed and no significant hemodynamic stenosis is detected in the coronary arteries. The patient was diagnosed with non-ischemic dilated cardiomyopathy and Perindopril/Indapamide/Amlodipine 5/1.25/5 1x1, Acetylsalicylic acid 100 mg 1x1, Atorvastatin 20 mg1x1, Spirinolactone 25 mg 1x1 and Furosemide 40 mg 2x1 were given as treatment. After he was discharged, he complained of severe nausea, vomiting, weakness and dizziness. The patient then to the internal medicine department of our hospital with these complaints. Creatinine (Blood) - 2.65 mg/dL, Glomerular Filtration Rate (GFR) - 27.08 mL/min/1.73m², Potassium (K) (Blood) – 4.3 mEq/L was found in patient's blood analysis. No abnormal pathology was detected in the patient's complete blood count, BNP value or any other laboratory tests. The patient was hospitalized due to acute kidney illness (AKI). It was determined that there was no previous kidney disease in the results in the national health system database. Dizziness and bradycardic pulse values were seen in the patient's follow-ups which lead for to our department.

The patient was evaluated at the bedside. The patient's vital signs showed a pulse rate of 40 beats/min, blood pressure was within normal limits, and there were no abnormal findings in other vital signs. On physical examination of the patient, there was pretibial edema bilaterally and 2/6 murmur was present in the mitral and tricuspid oscultation areas. In bilateral lung auscultation of the patient, respiratory sounds were decreased in the basal parts of the lung. The patient's 12-lead electrocardiography (ECG) revealed 40 beats/min sinus bradycardia (Figure-1).

TTE was performed. The patient's EF measured by the Modified Simpson's method was 42%, moderate mitral and tricuspid regurgitation with 11 mm of pericardial fluid in the deepest part was found and no signs of collapse or intracardiac mass/vegetation. Li level of the patient was determined as 1.33 mmol/L. Sinus bradycardia secondary to Li intoxication was considered in the patient. For this reason, Hemodialysis (HD) was performed to the patient. The Li level was found to be normal in control blood tests and ECG was found 69 beats/min sinus rhythm (Figure-2), after patient was underwent a total of 4 cycles of HD. It was observed that the patient's dizziness and presyncope complaints are also regressed. After discharge, the patient was excluded from cardiac follow-up with the recommendation of a close-term cardiology outpatient follow-up.

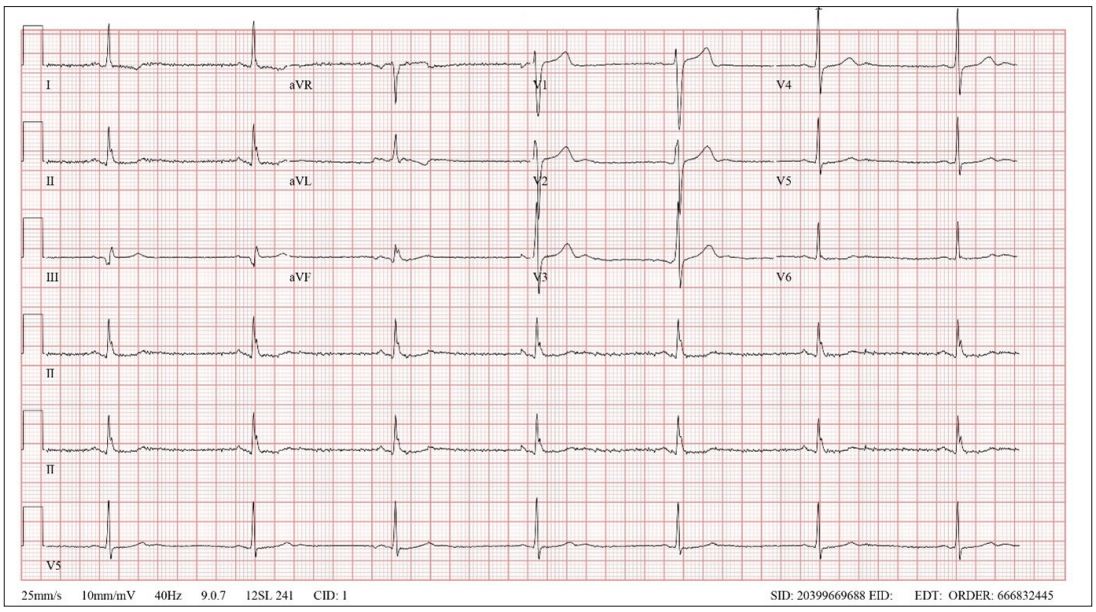

Figure 1: ECG, Sinus Bradycardia at the time of initial evaluation of the patient

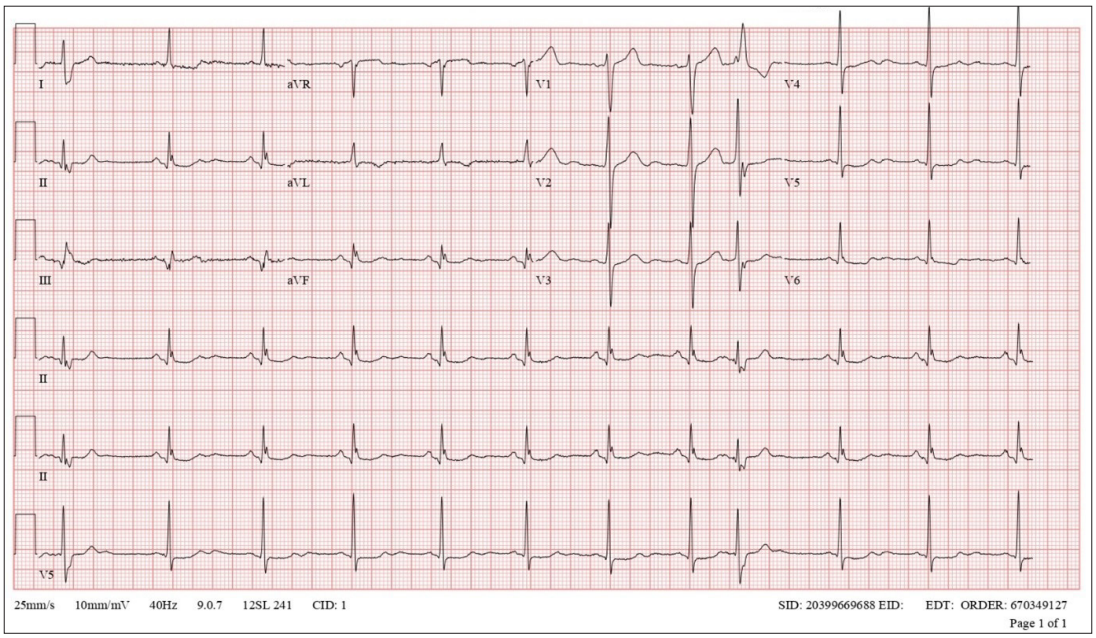

Figure-2: ECG showing normal heart rate in the follow-up of the patient after 4 cycles of HD

Discussion

Li is important in the acute and maintenance treatment of bipolar illness (Malhi et al., 2017). In addition, the therapeutic range of Li is narrow and is between 0.6-1.3 mmol/L (Spatola et al., 2023).

When there is a situation that reduces the GFR level, reabsorption from the renal tubules may increase due to the similarity of Li to sodium ion (Finley et al., 1995). Although the half-life of Li is between 12-27 hours, it has been shown that the half-life can be extended up to 58 hours depending on the patient's GFR level and chronically long use (Okusa & Crystal, 1994). In our patient, ACEi and sprinolactone were started with the diagnosis of non-ischemic dilated cardiomyopathy. Our patient had also CAG procedure. There could be two reasons for the development of AKI in our patient. In the current situation, the development of contrast nephropathy in the patient with low EF and the initiation of nephrotoxic agents such as ACEi and spirinolactone. When the literature is reviewed, the risk of developing contrast nephropathy is high in patients with low EF (Ozbeyaz et al., 2023). In our patient, both low EF and initiation of nephrotoxic agents had a combined effect, causing contrast nephropathy and acute kidney injury.

Although sinus bradycardia is the most common cardiac ECG change in Li poisoning, conditions such as QT prolongation, sinoatrial blocks, sinus node dysfunction and ST elevation can be observed (Ferensztajn-Rochowiak & Rybakowski, 2023). There are conflicting results between the correlation of serum Li level and cardiac functions (Ferensztajn-Rochowiak & Rybakowski, 2023), (Khasraw et al., 2012). Although the mechanism of producing Li arrhythmia has not been clearly

clarified, it has been suggested that one of the mechanisms of causing bradycardia is the restriction of sodium influx into sinoatrial node cells (Oudit et al., 2007). Sodium, potassium and calcium are critical for the continuation of cardiac rhythm within normal limits, and Li can cause arrhythmias due to its cationic nature and similar structure to these ions.

Currently, the best treatment method in Li intoxication is discontinuation of the drug and intermittent HD application (Spatola et al., 2023). The patient's heart rate turned from bradycardia to normal heart rate levels in the follow-ups after receiving HD 4 times in total.

In a previous case report, a patient who developed atrial fibrillation, sinus arrest, sinus bradycardia after Li intoxication and recovered after HD treatment (Rijal et al., 2022). Li intoxication is a rare condition and its true prevalence is unknown. Cardiac side effects can cause morbid results. In this case, we showed that symptomatic sinus bradycardia may be present with a moderate Li level elevation. Li intoxication must be taken into account when complaints such as syncope, dizziness, nausea and vomiting develop in patients using Li and have undergone CAG.

Patient Consent

The possible benefits that can contribute to the literature about the case report were explained from the patient, and written consent was obtained from the patient and added to the hospital archive.

Conflict Of İnterest: None.

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