THE ANATOLIAN JOURNAL OF CARDIOLOGY

Official journal of the TURKISH SOCIETY OF CARDIOLOGY

Lithium Toxicity with Sinus Bradycardia and Takotsubo Syndrome in a Patient with Bipolar Disorder

A 65-year-old woman with a medical history of bipolar disorder (on lithium 1200 mg q.d.), hypertension, hypothyroidism, and a recent left nephrectomy was transferred to the emergency department due to altered mental status, dysarthria, and tremor. Her son reported that her symptoms had started two days ago and handed over blood test exams performed on an outpatient basis that showed an elevated serum lithium concentration of 2.58 mEq/L (normal values 0.6-1.2 mEq/L).

On presentation, the patient had normal vital signs, was afebrile, and lethargic with a GCS of 14/15 (E:4-V:4-M:6). The electrocardiogram (ECG) showed sinus rhythm at 60 bpm with a left bundle branch block (LBBB) pattern. Apart from the immediate neurologic and psychiatric assessment, the patient underwent a brain CT scan, which was unremarkable. She was admitted to the internal medicine department with a diagnosis of lithium toxicity; lithium was discontinued, and parenteral IV fluids were administered.

The next day the patient complained of chest pain, and a new ECG showed sinus bradycardia at 42 bpm, LBBB, and diffuse new deeply inverted T waves (Figure 1 A). Cardiac high-sensitivity troponin T was elevated at 1791 pg/mL (normal values <14 pg/mL) and NT-proBNP was highly elevated at 13 303 pg/mL (normal values <399 pg/mL). Transthoracic echocardiography showed a reduced left ventricular ejection fraction (LVEF) of 35% and severe hypokinesia of the apical LV myocardial segments. An invasive coronary angiography showed unobstructed coronary arteries (Figure 1B and C) and left ventriculography demonstrated apical ballooning suggestive of Takotsubo syndrome (Figure 1D and E, Video 1). The patient was then transferred to the coronary care unit on IV isoprenaline along with supportive heart failure therapy and adequate hydration.

The following days, serum lithium levels decreased to 1.1 mEq/L, the patient's neurologic symptoms gradually resolved, and heart rate improved.

On discharge, a repeat echocardiogram revealed improvement of LV systolic function with an LVEF of 45%, thus enhancing the diagnosis of Takotsubo syndrome. Surprisingly, an apical thrombus was revealed in the hypokinetic LV apex (Figure 1F), despite receiving prophylactic anticoagulation with low-molecular-weight heparin (LMWH). Thrombus presence was confirmed with echo-contrast, and apixaban 5 mg b.i.d. was added to her medications. A follow-up echocardiogram in a satellite hospital two months later confirmed complete LV systolic improvement and thrombus resolution.

Lithium is a mood stabilizer that has been used as an effective treatment option for patients with bipolar disorder. However, its use mandates careful serum concentration monitoring due to its narrow therapeutic window of 0.6-1.2 mEq/L.[1] Lithium toxicity more commonly manifests with neurological and gastrointestinal side effects, but cardiac manifestations such as ECG changes, arrhythmias, and/or cardiomyopathy are also reported. The most common ECG findings are T wave inversions and sinus bradycardia.[2,3] Our patient had both of these ECG

E-PAGE ORIGINAL IMAGE

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Cite this article as: Papadopoulos S, Stavropoulou E, Theodoropoulos KC, et al. Lithium toxicity with sinus bradycardia and takotsubo syndrome in a patient with bipolar disorder. *Anatol J Cardiol.* 2024;28(12):E-35-E-36.

DOI:10.14744/AnatolJCardiol.2024.4749

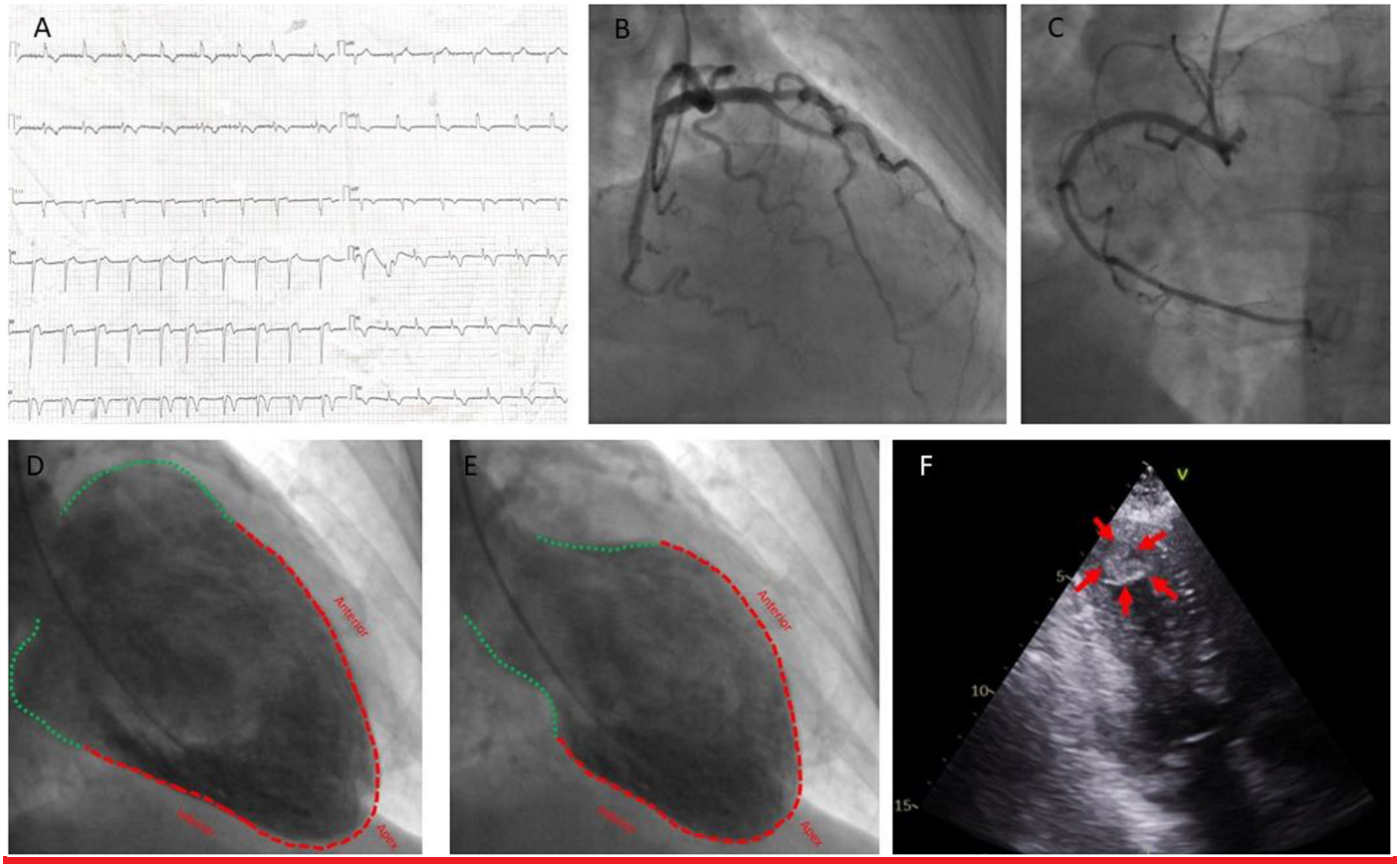

Figure 1. (A) Electrocardiogram showed LBBB and deep inverted T waves in leads I, II, aVL, aVF, V3-V6. (B) Coronary angiogram, unobstructed left coronary system. (C) Coronary angiogram, unobstructed right coronary artery. (D) Left ventriculogram in diastole. (E) Left ventriculogram in systole. The mid and apical segments of the anterior and inferior LV myocardial walls and the apex (red dotted line) are severely hypokinetic, while the basal segments of the respective walls (green dotted line) show normal contraction during systole. (F) Transthoracic echocardiogram, apical three-chamber view. Apical thrombus of the left ventricle is observed (arrows). ECG, electrocardiogram.

manifestations. Lithium is almost exclusively excreted by the kidneys. Even though our patient did not have known chronic renal insufficiency, we can assume that the history of a recent nephrectomy 2 months ago probably had contributed to the reduced renal excretion of lithium.

Although there are limited data regarding lithium toxicity and Takotsubo syndrome, elevation in plasma catecholamine levels caused by lithium intoxication could be associated with Takotsubo syndrome.[4] On the other hand, pre-existing psychiatric illness is a recognized risk factor for Takotsubo syndrome.[5]

Clinicians should have a high index of suspicion for this rare but serious cardiotoxic side effect when treating patients with lithium intoxication.

Informed Consent: Written informed consent was obtained from the subject prior to participation in the study.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: The authors declared that this study has received no financial support.

Video 1: Invasive left ventriculography is suggestive of Takotsubo syndrome.

REFERENCES

1. Haussmann R, Bauer M, von Bonin S, Grof P, Lewitzka U. Treatment of lithium intoxication: facing the need for evidence. *Int J Bipolar Disord*. 2015;3(1):23. [CrossRef]
2. Gitlin M. Lithium side effects and toxicity: prevalence and management strategies. *Int J Bipolar Disord*. 2016;4(1):27. [CrossRef]
3. Khalid M, Sheikh W, Sherazi M, Imran TF. Lithium-induced bradycardia and cardiomyopathy in a patient with bipolar disorder and paranoid schizophrenia. *Cureus*. 2023;15(6):e40949. [CrossRef]
4. Kitami M, Oizumi H, Kish SJ, Furukawa Y. Takotsubo cardiomyopathy associated with lithium intoxication in bipolar disorder: a case report. *J Clin Psychopharmacol*. 2014;34(3):410-411. [CrossRef]
5. Nayeri A, Rafla-Yuan E, Farber-Eger E, et al. Pre-existing psychiatric illness is associated with increased risk of recurrent takotsubo cardiomyopathy. *Psychosomatics*. 2017;58(5):527-532. [CrossRef]