Journal of Acute Disease

journal homepage: www.jadweb.org

doi: 10.4103/2221-6189.241029

A severe case of levothyroxine intoxication successfully treated in intensive care unit

Yusuf Savran[1✉], Tugce Mengi[1], Merve Keskinkilic[2]

[1]*Department of Internal Medicine Medical Intensive Care Unit, Dokuz Eylul University Faculty of Medicine, Izmir, Turkey*

[2]*Department of Internal Medicine, Dokuz Eylul University Faculty of Medicine, Izmir, Turkey*

ARTICLE INFO

Article history:
Received 1 December 2017
Revision 18 February 2018
Accepted 24 June 2018
Available online 31 August 2018

Keywords:
Levothyroxine
Intoxication
Critical care
Suicide

ABSTRACT

Levothyroxine intoxication is a rare clinical entity which is usually asymptomatic. However, severe symptoms such as respiratory failure, malignant hyperthermia, seizures, arrhythmia, and coma have been reported. In this case report, a patient who ingested high dose (15 mg) levothyroxine for suicide and admitted to intensive care unit was presented. There was a decrease in Glasgow coma score in the follow-up. The patient was intubated due to acute respiratory failure. Gastric lavage, activated charcoal, methylprednisolone, cholestyramine and therapeuthic plasma exchange were administered. Despite ingestion of high dose of levothyroxine, thyrotoxicosis symptoms resolved with appropriate treatment and the patient was discharged from the intensive care unit.

1. Introduction

Hypothyroidism is a common disease which is treated with levothyroxine sodium (L-T4) 1,2-1,6 μg/kg/d[1]. Intoxication of L-T4 is a rare clinical entity and more frequently observed in children. While L-T4 ingestion in children is mainly accidental, adults more often take the drug for suicide[2].

The symptoms of thyrotoxicosis become apparent usually after chronic overdose consumption[2]. Cases of acute L-T4 ingestion are usually asymptomatic and doses of 3-4 mg/d are tolerated well[3].

The clinical findings of thyrotoxicosis are tachycardia, agitation, hyperhydrosis, anxiety, vomiting, tremor, diarrhea, flushing and irritability[3-5]. Additionally, severe symptoms like respiratory failure, malignant hyperthermia, convulsions, arrythmia and coma are also reported[3,4]. A severe case of levothyroxine sodium intoxication (15 mg) treated in our intensive care unit (ICU) is presented.

2. Case report

A 38-year-old female patient was brought to the Emergency Service due to committing suicide by ingestion of a hundred tablets of 150 mcg L-T4 (15 mg), eight tablets of 20 mg olanzapine (160 mg) and eight tablets of citalopram hydrobromide (160 mg).

Her husband declared that she has suffered postpartum psychotic disorder for 2 years, underwent total thyroidectomy operation with the diagnosis of Grave's disease 3 years ago and suffered iatrogenical hypoparathyroidism thereafter and was using L-T4 150 mcg/d, olanzapine 20 mg/d, citalopram hydrobromide 20 mg/

✉First and corresponding author: Yusuf Savran, Department of Internal Medicine Medical Intensive Care Unit, Dokuz Eylul University Faculty of Medicine.
E-mail: yusufsavran@yahoo.com

How to cite this article: Savran Y, Mengi T, Keskinkilic M. Diminazene A severe case of Levothyroxine intoxication successfully treated in Intensive Care Unit. J Acute Dis 2018; 7(4): 175-177.

d, calcium and calcitriol daily. In the first physical examination in the emergency room agitation, systolic hypertension (178/84 mmHg) and tachycardia (143 beats/min) were detected. Glasgow coma score was 15 and sinus tachycardia was detected (143 beats/min) on electrocardiography. Laboratory investigation detected thyroid stimulating hormone (TSH): 0.03 μIU/mL (reference limits: 0.38-5.33 μIU/mL), free T4 (fT4): 5.71 ng/dL (reference limits: 0.50-1.51 ng/dL) which showed apparent hyperthyroidism. Gastric lavage and activated carbon was administered at the Emergency Service and she was admitted to our ICU with the diagnosis of levothyroxine intoxication. First evaluation of the patient in ICU revealed a Glasgow coma score of E4V3M5, blood pressure:160/88 mmHg, pulse:140 beats/min rythmic, respiratory rate: 32 /min. Arterial blood gas analysis showed pH: 7.50; $PaCO_2$: 25.4 mmHg; PaO_2: 61 mmHg; SaO_2: 88%. Non-invasive mechanical ventilation support with CPAP: 10 $cmHO_2$ was started with the diagnosis of acute respiratory failure. She could not tolerate this treatment modality and got agitated, tachycardic, tachypneic and desaturated. She was electively intubated and invasive mechanical ventilation support was started with appropriate sedoanalgesia.

A radial artery catheter and central internal jugular vein catheter were placed for close hemodynamical monitorization and treatment lines. A femoral vein hemodialysis catheter was placed for therapeuthic plasma exchange. A nasogastric tube (NT) was placed for treatment and enteral nutrition. Propranolol 4×20 mg (NT) and metylprednisolone 3×20 mg intravenously were administered to prevent the peripheral transformation of levothyroxine sodium to triiodothyronine (T3) and cholestyramine 3×3 gr (NT) was administered to prevent the absorption of levothyroxine sodium. Therapeuthic plasma exchange with albumin was applied twice to protect the patient from a thyroid storm in the first 48-72 h. The thyroid funtion tests during the follow-up are shown on Table 1.

Table 1

Thyroid funtion tests result.

Time from ingestion of levothyroxine (h)	TSH (μIU/mL)	fT4 (ng/dL)	fT3 (pg/mL)
2 h	0.030	5.71	-
10 h	0.020	4.62	-
18 h	<0.015	4.22	4.00
84 h	<0.015	2.91	3.15
166 h	<0.015	2.05	2.56

The patient was consulted with psychiatry department because of her prior diagnosis of pospartum psychotic disorder and according to their recommendation olanzapine and citalopram hydrobromide was restarted in lowest doses. During the follow-up her vital signs ameliorated day by day and she was hemodynamically and neurologically stable on the 5th day of her hospitalization. She was successfully extubated on the 5th day and did not need any ventilatory support thereafter. She was successfully discharged to hospital floor on the 6th day and discharged from the hospital on the 8th day in a healthy state.

3. Discussion

The clinical reflection of massive L-T4 ingestion in adult patients can present with a wide range of symptoms. Intoxication symptoms can be minimal or may present with severe symptoms such as dysrhythmia, respiratory failure, myocardial infarction, hemiparalysis, hypertermia and coma[6]. Binimelis *et al* reported 6 cases of thyrotoxicosis after 7-12 mg of L-T4 ingestion. Five of these cases were comatous and one case presented with stupor. There was left ventricular failure in two cases and arrhythmia in three cases[7].

The biologically active part of thyroid hormones is T3. Symptoms in thyrotoxicosis become apparent as T4 is transformed to T3. Therefore patients may be asymptomatic during the first 24 h[5]. Also, symptoms may last or worsen for 11 days because of the long half-life (7 days) of levothyroxine[5]. Our case presented with thyrotoxicosis symptoms such as tachycardia and agitation in 2 h after ingestion of 15 mg of L-T4. There may be various causes of these symptoms becoming apparent in such a short time. One of them may be the shortening of half-life of levothyroxine when ingested in massive doses[8]. Also olanzapine and citalopram hydrobromide have cardiotoxic and neurotoxic side effects; though there is not massive doses of these drugs ingested, they may have exacerbated agitation and tachycardia[9,10].

Nygaard *et al* reported that there is no relation between the severity of symptoms and ingested dose in levothyroxine intoxication[4]. In our case, moderate symptoms like tachycardia and agitation in the early period and acute respiratory failure afterwards were observed. Although there is no consensus regarding treatment; first of all, patients should be closely monitored. Gastric lavage and active carbon application should be performed to prevent gastrointestinal absorption. Cholestyramine binds to thyroxine and increases elimination via decreasing systemic absorption. Beta-blockers (propranolol 1-2 mg/kg/d) decrease sympathetic hyperactivity and control tachycardia. Propylthiouracil (5-7 mg/kg/d) decreases transformation of fT4 to fT3. Glucocorticoids and sodium ipodate also decrease the transformation of fT4 to fT3 and may be used in combination with beta blockers in patients with severe symptoms[11-13]. Hemodialysis is minimally effective since fT3 and fT4 are highly bound to serum proteins[12]. Hemoperfusion and therapeutic plasma exchange decrease fT4 levels[7,14]. According to up to date knowledge, we applied therapeuthic plasma exchange with albumin for 2 days and administered propranolol 80 mg/d, methylprednisolone 60 mg/d and cholestyramine 9 gr/d.

Levothyroxine intoxication is a rare clinical entity which may be

asymptomatic or may present with symptoms of a wide variety. It requires close hemodynamical monitoring and hospitalization of the patient for at least 5-7 days. As far as we know, there is no higher dose of levothyroxine intoxication reported previously in the literature. Despite severe symptoms such as acute respiratory failure requiring mechanical ventilation support, she was successfully treated and discharged in a healthy state. We wanted to emphasize a rare clinical entity which may be highly mortal when not treated appropriately.

Conflict of interest statement

We declare that we have no conflict of interest.

References

[1] *Tiroid Hastaliklari Tani ve Tedavi Kilavuzu*. TEMD 2017. [Online] Available from: http://www.turkendokrin.org/files/4_TIROID_PRESS.pdf.

[2] Korkmaz HA, Dizdarer C, Hazan F, Karaarslan U. Attempted suicide with levothyroxine in an adolescent girl. *J Pediatr Endocrinol Metab* 2013; **26**(1-2): 129-131.

[3] Güngör A, Bilen H, Akba EM, ve ark. Levotiroksin sodyum ntoksikasyonu: Olgu Sunumu. *Abant Med J* 2013; **2**(3): 227-228.

[4] Nygaard B, Saedder EA, Dalhoff K, Wikkelsoe M, Jürgens G. Levothyroxine poisoning-symptoms and clinical outcome. *Basic Clin Pharmacol Toxicol* 2015; **117**(4): 280-285.

[5] Kılınç F, Aydın BB, Pekkolay Z, ve ark. Levotiroksin intoksikasyonu: Olgu sunumu. *Dicle Med J* 2015; **42**(2): 265-267.

[6] De Luis DA, Dueñas A, Martin J, Abad L, Cuellar L, Aller R. Light symptoms following a high-dose intentional L-thyroxine ingestion treated with cholestyramine. *Horm Res* 2002; **57**(1-2): 61-63.

[7] Binimelis J, Bassas L, Marruecos L, Rodriguez J, Domingo ML, Madoz P, et al. Massive thyroxine intoxication: Evaluation of plasma extraction. *Intensive Care Med*1987; **13**(1): 33-38.

[8] Medeiros-Neto G. Thyroxine poisoning. In: De Groot LJ, Chrousos G, Dungan K, et al., editors. *Endotext [Internet]*. South Dartmouth (MA): MDText.com, Inc.; 2000.

[9] Kraai EP, Seifert SA. Citalopram overdose: A Fatal Case. *J Med Toxicol* 2015; **11**(2): 232-236.

[10]Palenzona S, Meier PJ, Kupferschmidt H, Rauber-Luethy C. The clinical picture of olanzapine poisoning with special reference to fluctuating mental status. *J Toxicol Clin Toxicol* 2004; **42**(1): 27-32.

[11]Lehrner LM, Weir MR. Acute ingestions of thyroid hormones. *Pediatrics* 1984; **73**(3): 313-317.

[12]Shilo L, Kovatz S, Hadari R, Weiss E, Nabriski D, Shenkman L. Massive thyroid hormone overdose: Kinetics, clinical manifestations and management. *Isr Med Assoc J* 2002; **4**(4): 298-299.

[13]Berkner PD, Starkman H, Person N. Acute *L*-thyroxine overdose; therapy with sodium ipodate: Evaluation of clinical and physiologic parameters. *J Emerg Med* 1991; **9**(3): 129-131.

[14]Kreisner E, Lutzky M, Gross JL. Charcoal hemoperfusion in the treatment of levothyroxine intoxication. *Thyroid* 2010; **20**(2): 209-212.