Case Report

No obvious symptoms in acute (eltroxin) thyroxine poisoning in euthyroid – A case report

E.A.Ashok Kumar[1*], Shaikh Saquib Shahabuddin Shaikh[2]

[1]Professor, [2]Post Graduate
Department of General Medicine, Maheshwara Medical College & Hospital, Sangareddy, Telangana, India
[*]Corresponding author email: **ashokedla@gmail.com**

International Archives of Integrated Medicine, Vol. 9, Issue 12, December, 2022.
Available online at http://iaimjournal.com/
ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**
Received on: 25-11-2022 **Accepted on:** 3-12-2022
Source of support: Nil **Conflict of interest:** None declared.

How to cite this article: E.A.Ashok Kumar, Shaikh Saquib Shahabuddin Shaikh. No obvious symptoms in acute (eltroxin) thyroxine poisoning in euthyroid – A case report. IAIM, 2022; 9(12): 18-23.

Abstract

Levothyroxine (T4) (Eltroxin) poisoning is a rare clinical entity which is usually asymptomatic. It can occur accidently, mostly in children, and can happen intentionally in adults with suicidal intention especially psychiatric patients. Thyrotoxicosis from an overdose of medicinal thyroid hormone is a condition that may be associated with a significant delay in onset of toxicity. However, severe symptoms such as respiratory failure, malignant hyperthermia, seizures, arrhythmia, and coma have been reported. In this case report, we present a patient who ingested high doses of levothyroxine i.e., 90 tab. of Eltroxin 100 mcg, for suicidal intension and admitted to intensive care unit. She is an euthyroid person but took these tablets, which her mother was taking Eltroxin tablets for hypothyroidism. Gastric lavage was done with activated charcoal, Inj. Hydrocortisone, Tab Propranolol and Tab Neomercazole administered. Despite ingestion of high dose of levothyroxine, thyrotoxicosis symptoms like palpitations resolved with appropriate treatment and the patient was discharged after complete recovery.

Key words

Levothyroxine (Eltroxin) poisoning, Sympathetic excitation, Thyrotoxicosis, Propranolol, Hydrocortisone, Neomercazole.

Introduction

Thyrotoxicosis is characterized by increased thyroxine levels in the blood circulation, which can cause excited sympathetic activities and high metabolic signs, including variety of symptoms such as fever, irritability, tachycardia, diarrhea, and seizure [1–4]. Severe features, though rare, like thyroid storm involving cardiac, neurological, respiratory and thermoregulatory center can occur. Acute levothyroxine ingestion up to a dose of 4 mg/day is usually asymptomatic and well tolerated. Levothyroxine, as an analog of thyroxine, is widely used for hypothyroidism. Levothyroxine T4 is converted to T3 which is an active part of thyroid hormone and is responsible for many adverse effects when in excess. This process of deiodination usually takes 24–48 hours which explains why the patients are asymptomatic during the initial presentation and may persistently remain symptomatic for over a week considering the half-life of the hormone. Although there are huge numbers of patients with hypothyroidism using levothyroxine as a treatment, only a few cases of levothyroxine overdose were reported worldwide and most of them were in pediatric group. [5]. Generally mild and benign course was followed by levothyroxine overdose in pediatric cases. According to the available literature, some severe manifestations were also shown in several reports such as malignant hyperthermia, cardiac arrhythmias, seizures, coma, and thyroid storm after consuming even low dosages of levothyroxine [4, 6–8].

Clinical features

The symptoms of thyrotoxicosis become apparent usually after chronic overdose consumption [9]. Cases of acute L-T4 ingestion are usually asymptomatic and doses of 3-4 mg/d are tolerated well [10]. The clinical findings of thyrotoxicosis are tachycardia, agitation, hyperhidrosis, anxiety, vomiting, tremor, diarrhea, flushing and irritability [10-12]. Additionally, severe symptoms like respiratory failure, malignant hyperthermia, convulsions, arrythmia and coma are also reported [10, 11]. A case of acute thyroxine poisoning (9 mg) treated in our intensive care unit (ICU) is presented.

Case report

A 19 year old female patient consumed 90 tablets of levothyroxine (Eltroxine) 100 mcg on day of admission at her residence, with suicidal intent. She was an euthyroid person but took these tablets,which her mother was taking eltroxin tablets for hypothyroidism. Pt. complained of palpitations after 30 minutes of ingestioin. Pulse was regular and there was no post palpitation dizziness, there were no complains of fever, flushing, diarrhea, sweating, vomitting and headache.

At the time of presentation: day I

General examination

Patient was conscious, coherent, answering questions well, moderately built and nourished, no pallor, no icterus, no cyanosis, no clubbing, no generalized lymphadenopathy and no pedal edema.

Vital data: Temp: 98°F, Pulse- 110/min, regular, normal volume, BP- 100/70 mm Hg, RR- 18/ min, Spo2- 98% at room air

Systemic examination: Cardiovascular and respiratory systems were normal. There was no rigidity of abdomen and there was no organomegaly. CNS examination was normal at the time of presentation. there were no signs of thyrotoxicosis.

Investigations

CBP- Hb- 12.0 g/dl; RBC- 4.9 million/cumm; WBC- 12,000 cells/cumm; DC: N- 77%, L-16%, E-2%, M- 0%, B- 0%; Platelets - 3.6 lakhs/ Cumm; ESR – 10 mm 1st hour, CUE- ketone bodies +++, RBS- 82 mg/dl; B. Urea - 13 mg/dl; S. Creatinine: 0.7 mg/dl; S.Na^{+}145 mmol/l; S. K^{+}- 4.3 mmol/l;S. Cl^{-}109 m.mol/l; ECG- a) ECG was normal on Day 1, b) ECGs on 4th day showed Sinus Arrythmia; Chest X ray - Normal; USG of Thyroid Gland - Normal study, Thyroid profile a) on the day of admission T3 = 3.19 ng/ml, T4 => 30.0 mcg/dl, TSH = 0.2 µIU/ml b) on 5th day, T3 = 2.87 ng/ml, T4 = 21.7 mcg/dl,

TSH = 0.02 µIU/ml, c) on 11th day, it was T3 = 2.41 ng/ml, T4 = 17.0 mcg/dl, TSH = 0.02 µIU/ml; on 14th day, T3 = 2.20 ng/ml, T4 = 15.0 mcg/dl, TSH = 0.04 µIU/ml (**Table – 1**); Anti TPO antibodies = 5.0 IU/ml; Thyroglobulin = 2.91 ng/ml; 2D ECHO: Mitral valve, Aortic Valve, Tricuspid Valve, Pulmonary Valve = Normal, Left Atrium = 3.5 cm; IVS(d) = 1.0 cm; LVID(d) 4.2 cm EF = 65%, Left Ventricle PW(d) = 0.9 cm; LVID(d) = 2.9 cm, FS = 35% Left Atrium, Right Ventricle, Right Atrium Pulmonary Artery = Normal; IVS & IAS Intact; Pericardium = no PE. Impression = No congenital abnormality, Normal size cardiac chambers, No LV RWMA, Normal LV/RV Function, Normal valves, No PE/ Clots. Psychiatry opinion taken and opined as Deliberate self harm by the patient.

Table – 1: Thyroid function tests result.

Days after ingestion of Levothyroxine	TSH (µIU/mL)	fT4 (ng/dL)	fT3 (pg/mL)
Day 1	0.21	>30.0	3.19
Day 5	0.02	21.7	2.87
Day 11	0.02	17.0	2.41
Day 14	0.04	15.0	2.20

Table – 2: Pharmacokinetics of Thyroxine [21].

Pharmacokinetics of thyroxine	
Main site of absorption	Small intestine (jejunum and ileum)
Bioavailability	70–80 % in euthyroid person; may be slightly higher in hyperthyroid patients
Tmax	2–3 hours
Vd	11–15 L
Protein binding	T4 >99.9 % T3 = 99.8 %
T1/2	T4 = 6.2 and 7.5 days in euthyroid and hypothyroid patients, respectively T3 = 1.0 and 1.4 days in euthyroid and hypothyroid patients, respectively
Clearance	T4 = 0.055 and 0.038 L/h in euthyroid and hypothyroid patients respectively

Vd = Volume of distribution; L = Litres

Diagnosis

Acute (Eltroxin) Thyroxine Poisoning in Euthyroid

Treatment given

1) Gastric Lavage done with activated charcoal 50gm
2) IVF - 2NS, 2DNS
3) Tab Propranolol 10 mg OD,
4) Inj. Hydrocotisone 100 mg IV TID,
5) Inj. Optineuron 1 Amp. IV OD,
6) Tab. Neo-Mercazole 10mg STAT,
7) Tab. Paracetamol 650 TID,
8) syp. Sucralfate 4 tsp TID.

Discussion

A massive L-Thyroxine (T4) overdose may be accidentally and unintentionally ingested, most commonly by children and adolescents. It may occur intentionally in young and older adults in an attempt to lose weight, with suicidal intentions, or for undeclared purposes. In some localities thyroxine may be obtained at drugstores without prescription (mostly in the generic form). In some reports thyroxine preparations by a pharmacist had an erroneous LT4 dosage. Thyroid hormone pills used to treat hypothyroid dogs typically contains a much higher dose of thyroid hormone and if mistakenly

taken by humans can lead to thyroxine poisoning [20].

Accidental Levothyroxine poisoning is more common in the pediatric population [17] than adult age groups where the overdose is more likely suicidal considering the collateral psychiatric illness but the case reports are very few [14-16]. Cases of adults ingesting overdose levothyroxine are extremely rare. The clinical presentation of levothyroxine overdose in adult patients can present with a wide range of symptoms. Massive levothyroxine ingestion can cause excessive thyroid hormone in the blood circulation and then lead to sympathetic excitation. Common effects include nervousness, insomnia, mild tremor, tachycardia, mild elevation of body temperature, blood pressure elevation and loose stools [18]. Severe symptoms such as dysrhythmia, respiratory failure, myocardial infarction, hemiparalysis, hyperthermia and coma [19]. Binimelis, et al. reported 6 cases of thyrotoxicosis after 7-12 mg of L-T4 ingestion. Five of these cases were in coma and one case presented with stupor. There was left ventricular failure in two cases and arrhythmia in three cases [20]. 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. symptoms may last or worsen for 11 days because of the long half-life (7 days) of levothyroxine [12] see **Table - 2**.

Table – 3: Alternative treatment of thyroxine overdose [26].

Decontamination	a) Gastrointestinal decontamination b) Oral activated charcoal c) Bile acid sequestrants such as cholestyramine
Symptomatic treatment	a) Acetaminophen for fever b) Beta blocker for tachycardia, such as propranolol c) Benzodiazepines for agitate and seizures, such as phenobarbital
Decrease conversion of T3 to T4	a) Propylthiouracil b) Glucocorticoids c) Iopanoic acid and sodium ipodate
Reduce serum level of thyroid hormone	Hemodialysis and plasmapheresis
Monitor	Prolonged monitoring of vital signs and serum levels of thyroid hormones

In our case report, the patient was asymptomatic but she had tachycardia and palpitations after 6 hours of 9 mg of levothyroxine (eltroxin) ingestion. However, some studies claim no relationship between the severity of symptoms and dose [22].

Although there is no consensus regarding treatment; but the most important point is that the 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) decrease sympathetic hyperactivity and control tachycardia. Propylthiouracil decreases transformation of T4 to T3. Glucocorticoids and sodium ipodate also decrease the transformation of T4 to T3 and may be used in combination with beta blockers in patients with severe symptoms [18, 24, 25]. Hemodialysis is minimally effective since T3 and T4 are highly bound to serum proteins [24]. Hemoperfusion and therapeutic plasma exchange decrease T4 levels [20, 26] (**Table – 3**).

Although there are huge numbers of patients with hypothyroidism using levothyroxine as a treatment, only a few cases of levothyroxine overdose were reported worldwide and most of them were in pediatric group [5]. Generally mild and benign course was followed by levothyroxine intoxication in pediatric cases. According to the available literature, some severe manifestations were also shown in several reports such as malignant hyperthermia, cardiac arrhythmias, seizures, coma, and thyroid storm after intaking even low dosages of levothyroxine [4, 6–8].

She is euthyroid person but took these tablets. Actually her mother was taking eltroxin tablets forhypothyroidism.In our case 1) Gastric Lavage done with activated charcoal 50 gm administered. 2) IV fluids, Tab. Propranolol 10 mg, Inj. Hydrocortisone 100 mg, inj. Optineurin IV, Tab. Carbimazole 10 mg, tab. DOLO 650 and syp. Sucralfate were given. Others gave Propylthiouracil, but we gave Carbimazole. She was treated and discharged in a vitally stable state. We wanted to emphasize a rare clinical entity which may be highly mortal when not treated appropriately.

Conclusion

Levothyroxine (T4) (Eltroxin) poisoning is a rare clinical entity.In our case report the patient was euthyroid person but took these tablets. Actually patient's mother was taking eltroxin tablets for hypothyroidism. The patient was asymptomatic but she had tachycardia and palpitations after 6 hr of 9 mg of levothyroxine (eltroxin) ingestion.apart from routine care we gave Carbimazole whereas others gave Propylthiouracil.

Adults often exhibit more severe symptoms after in taking overdose levothyroxine due to their complex medical history and co-morbidities than children. As for them, hemodialysis should be considered as soon as possible. Besides, diverse treatments according to specific symptoms and continuously monitoring were indispensable.

References

1. Shilo L, Kovatz S, Hadari R, et al. Massive thyroid hormone overdose: kinetics, clinical manifestations and management. Isr Med Assoc J, 2002; 4: 298–9.
2. Vargas-Uricoechea H, Sierra-Torres CH. Thyroid hormones and the heart. Horm Mol Biol Clin Investig., 2014; 18: 15–26.
3. Litovitz TL, White JD. Levothyroxine ingestions in children: an analysis of 78 cases. Am J Emerg Med., 1985; 3: 297–300.
4. Tsutaoka BT, Kim S, Santucci S. Seizure in a child after an acute ingestion of levothyroxine. PediatrEmerg Care, 2005; 21: 857–9.
5. Lewander WJ, Lacouture PG, Silva JE, et al. Acute thyroxine ingestion in pediatric patients. Pediatrics, 1989; 84: 262–5.
6. Ioos V, Das V, Maury E, et al. A thyrotoxicosis outbreak due to dietary pills in Paris. Ther Clin Risk Manag., 2008; 4: 1375–9.
7. Majlesi N, Greller HA, McGuigan MA, et al. Thyroid storm after pediatric levothyroxine ingestion. Pediatrics, 2010; 126: e470–3.
8. Yu MG, Flores KM, Isip-Tan IT. Acute mania after levothyroxine replacement for hypothyroid-induced heart block. BMJ Case Rep., 2017; 2017: pii: bcr2016218819.
9. 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.
10. Güngör A, Bilen H, Akbaş EM, ve ark. Levotiroksinsodyum İntoksikasyonu: OlguSunumu. Abant Med J., 2013; 2(3): 227-228.
11. 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.

12. Kılınç F, Aydın BB, Pekkolay Z, ve ark. Levotiroksinintoksikasyonu: Olgusunumu. Dicle Med J., 2015; 42(2): 265-267.
13. Medeiros-Neto G. Thyroxine Poisoning. [Updated 2018 Jul 17]. In: Feingold KR, Anawalt B, Boyce A, et al., editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK279036/Thyroxine Poisoning;Geraldo Medeiros-Neto, MD.
14. Y. Savran, T. Mengi, M. Keskinkilic, A severe case of levothyroxine intoxication successfully treated in intensive care unit. J Acute Dis., 2018; 7: 175–177.
15. S.J. Matthews. Acute thyroxine overdosage: two cases of parasuicide. Ulster Med. J., 1993; 62(2): 170–173.
16. K.M. Allen, V.B. Crawford, J.V. Conaglen, M.S. Elston, Case report: clues to the diagnosis of an unsuspected massive levothyroxine overdose, Can. J. Emerg. Med., 2015; 17(6): 692–698.
17. T.L. Litovitz, J.D. White. Levothyroxine ingestions in children: an analysis of 78 cases. Am. J. Emerg. Med., 1985; 3(4): 297–300.
18. Lehrner LM, Weir MR. Acute ingestion of thyroid hormones. Pediatrics, 1984; 73: 313-17.
19. 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.
20. 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.
21. Colucci P, Yue CS, Ducharme M, Benvenga S. A Review of the Pharmacokinetics of Levothyroxine for the Treatment of Hypothyroidism. Eur Endocrinol., 2013 Mar; 9(1): 40-47.
22. B. Nygaard, E.A. Saedder, K. Dalhoff, M. Wikkelsoe, G. Jürgens, Levothyroxine poisoning - symptoms and clinical outcome, Basic Clin. Pharmacol. Toxicol., 2015; 117(4): 280–285.
23. 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.
24. 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.
25. Kreisner E, Lutzky M, Gross JL. Charcoal hemoperfusion in the treatment of levothyroxine intoxication. Thyroid, 2010; 20(2): 209-212.
26. Xue J, Zhang L, Qin Z, Li R, Wang Y, Zhu K, Li X, Gao X, Zhang J. No obvious sympathetic excitation after massive levothyroxine overdose: A case report. Medicine (Baltimore)., 2018; 97(23): e10909.