



# A case of thyroid storm; a challenge to diagnose

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## Abstract

Thyroid storm is a malignant presentation of hyperthyroidism which has a mortality rate of 10% to 30% around the world. Lack of direct laboratory test has made the diagnosis of thyroid storm a challenge in clinical practice. There is no consensus about the diagnosis of thyroid storm and the clinical view, which experience of the practitioner is vital for proper diagnosis of this situation. Early diagnosis may lead to fast initiation of aggressive treatment to prevent mortality. In this report, we present a case of thyroid storm which was first approached based on her gastrointestinal (GI) symptoms and re-visited in our center because of no improvement in her GI symptoms and also addition of CNS manifestations.

**Keywords:** Thyroid storm, Hyperthyroidism, Thyrotoxicosis, Toxic multi nodular goiter

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## Introduction

Thyroid storm, also known as thyrotoxic crisis, is the exacerbation of thyroid hyperthyroidism following grave's syndrome, toxic multinodular goiter and toxic adenoma of thyroid. This life-threatening condition is hard to diagnose owing to multi-organ failure and absence of universal high specific diagnostic criteria (1). However, rapid diagnosis of thyroid storm is vital, because of high mortality rate even following aggressive treatments in intensive care unit (10% to 30%) (2). The incidence of thyroid storm has not reported with confidence, because there is no exact laboratory test for this condition and also variable presentations. Nonetheless, it has been reported from 0.22% up to 10% in the literature (1-3). In addition, thyroid storm has been reported more frequently in women and more commonly in patients with Grave's disease (4). The most common cause of mortality in thyroid storm is a multi-organ failure (1,3).

It seems that metabolic crisis of thyroid storm is followed by a superimposed event such as thyroid surgery, infection, trauma, burn, diabetic ketoacidosis and hypoglycemia (5). Current reports indicate infection as the most common cause of thyroid storm (1,2,6). However, 25% to 43% of patients still have not a clear exacerbating factor. Furthermore, it has been suggested that incomplete or interrupted treatment of hyperthyroidism increase the risk of thyroid storm (5).

In this article, we report a case of thyroid storm following interrupted treatment of hyperthyroidism resulting from toxic multi-nodular goiter which has been first diagnosed and treated as peptic ulcer disease.

## Case Report

A 51-year-old female was visited with complaint of abdominal pain, nausea and vomiting since one month ago. The abdominal pain was peri-umbilical and crampy without any radiation. The pain was not positional and was not changed by defecation or eating. She had also weakness and fatigue, fever, sweating, palpitation, tremor, vertigo and 15 kg weight loss as well as hoarseness, spotting, thirst and dysphasia during a month before visiting.

She had past medical history of hyperthyroidism (resulting from toxic multi-nodular goiter) and hypertension, which was prescribed with methimazole and propranolol, but she had not taken her medications very well.

The patient had admitted to another emergency department 3 days before our visit and had undergone endoscopy which had shown duodenal ulcer with positive *Helicobacter pylori* test and also normal abdominal sonography. She had discharged with *H. pylori* eradication regiment (amoxicillin, bismuth and metronidazole). However, her symptoms had not alleviated and also she had started to have diarrhea. Thus, she went to our center. Physical examination findings in the first visit were as followed; pulse rate 120 per minute, blood pressure 130/100 mm Hg, and oral temperature 38.5°C. She had generalized abdominal tenderness, thyroid enlargement and tremor. She had no sign of Graves' ophthalmopathy.

The patient was hydrated in the emergency department, and blood, stool and urine samples were taken for laboratory measurements. Then the patient was admitted to intensive care unit. The laboratory results were as

### ■ Implication for health policy/practice/research/medical education

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followed; blood analysis, white blood cell count; 6500/ $\mu$ L, hemoglobin; 12.1 g/dL, hematocrit; 38.7%, platelet count;  $214 \times 10^3/\mu$ L, fasting blood sugar; 105 mg/dL, TSH; 0.015 mIU/mL, T3; 3.95 nmol/L, total T4; 21.5 nmol/L. Accordingly in urine analysis, urine protein was trace, ketones were detected in urine, WBC count; 6-7/hpf, RBC count; 4-5/hpf and no bacteria were detected in urine. Moreover, the stool exam revealed mucoid diarrhea with 18-20 WBCs per hpf with no fat droplet.

Thyroid sonography showed heterogeneous nodules in both lobes. In the middle of right lobe, there was a solid cystic nodule with well-defined cystic areas (6-7 mm), without calcification and peripheral vascular flow ( $16 \times 22 \times 24$  mm). At the bottom of right lobe in lateral part, a well-defined heterogenic, isoecho nodule without calcification and peripheral vascular flow was detected. In the left lobe, there was a solid echogenic nodule with well-defined internal cystic areas and peripheral vascular flow without calcification. Moreover, in the middle lower part of left lobe, there were two well-defined echogenic and hemogenic nodules with the size of  $12 \times 13$  mm without peripheral vascular flow. Spiral brain CT scan and audiometry were taken due to vertigo and both of them were normal.

Based on Burch-Wartofsky's criteria (Table 1), the signs and symptoms of patient was highly suggestive of thyroid storm. Therefore, she was treated with propylthiouracil, propranolol and dexamethasone while admitted to the intensive care unit. The symptoms were alleviated after one week and the patient was discharged.

### Discussion

Thyroid storm diagnosis is clinically and there is no exact test for this condition. Therefore, it should be treated following suspicion to reduce the risk of mortality. The overall clinical findings are including exaggerated hyperthyroidism signs and symptoms in addition to multi-organ failure (7). Among clinical presentations of thyroid storm, fever and tachycardia are almost universal in different reports. The other reported manifestations are including sweating, palpitation, dyspnea, cardiac ischemia, and atrial fibrillation (8,9). Some of these clinical signs could lead to life-threatening conditions especially tachyarrhythmia and high-output cardiac failure which could lead to cardiovascular shock (10,11). The neurologic manifestations range widely including from agitation and delirium to coma (1). Gastrointestinal symptoms are including nausea, vomiting, diarrhea and hepatic failure (12).

**Table 1.** Burch-Wartofsky's diagnostic criteria and scoring point for thyroid storm.

Diagnostic parameters	Scoring points	Patient scoring point
<b>Thermoregulatory dysfunction, temperature, °C (°F)</b>		
37.2-37.7 (99-99.9)	5	
37.7-38.2 (100-100.9)	10	
38.3-38.8 (101-101.9)	15	15
38.9-39.4 (102-102.9)	20	
39.4-39.9 (103-103.9)	25	
$\geq 40$ ( $\geq 104.0$ )	30	
<b>2. Central nervous system effects</b>		
Absent	0	
Mild (agitation)	10	10
Moderate (delirium, psychosis, extreme lethargy)	20	
Severe (seizures, coma)	30	
<b>3. Gastrointestinal-hepatic dysfunction</b>		
Absent	0	
Moderate (diarrhea, nausea/vomiting, abdominal pain)	10	10
Severe (unexplained jaundice)	20	
<b>4. Cardiovascular dysfunction, tachycardia, b.p.m.</b>		
90-109	5	
110-119	10	10
120-139	15	
$\geq 140$	25	
<b>5. Congestive heart failure</b>		
Absent	0	
Mild (pedal edema)	5	0
Moderate (bibasilar rales)	10	
Severe (pulmonary edema)	15	
<b>6. Atrial fibrillation</b>		
Absent	0	0
Present	10	

Burch and Wartofsky have presented a numeric scoring system in 1993 (6) for diagnosis of thyroid storm (Table 1). According to this system, each sign or symptom has a score which the final diagnosis of thyroid storm would be made based on the total score each case received. Nonetheless, it is recommended that this system could not replace with clinical judgment in practice (5). Furthermore, a Japanese group also reported the results of a nationwide study on clinical manifestations, diagnosis and incidence of thyroid storm in 2012. The authors also proposed a diagnostic criterion based on Japanese population consisting different arrangement of organ system exhibitions including CNS alterations, fever, tachycardia, heart failure and GI/hepatic disturbances. This survey reported the percentage of each clinical manifestation in patients with thyroid storm. For instance, more than 75% of patients had pulse rate more than 130, 84% of cases had CNS manifestations and heart failure had seen in 40% of patients. Moreover, 76% patients from all enrolled cases in this study with thyroid storm had more than 3 organ failure (1).

## Conclusion

In this report, the most prominent symptom of the patient was GI manifestations including abdominal pain, nausea and vomiting which was mismanaged by acute abdomen work-up and endoscopy. As we mentioned above, partially treated hyperthyroidism may lead to thyroid storm. The patient was a low-compliance case of hyperthyroidism which had not taken her medications regularly, thus, progressed into thyroid storm. According to the Burch-Wartofsky's criteria diagnostic criteria, the score earned according to the patient manifestations was highly suggestive of thyroid storm. Therefore, a more general approach is highly recommended for cases with a history of hyperthyroidisms, even if they have localized symptoms.

## Authors' contribution

MF and ZF managed the patient and prepared the manuscript. MF finalized the paper. All authors read and signed the final manuscript.

## Conflicts of interest

There were no points of conflicts.

## Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors. The patient has given his informed consent regarding publication of this case report.

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