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CASE REPORT

Multisystem clues pointing to thyroid storm: A case of new-onset hyperthyroidism with delayed recognition and severe systemic complications

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Introduction: Thyrotoxic crisis is a rare, but potentially fatal endocrine emergency resulting from a sudden surge in thyroid hormone activity. Early recognition is critical, however atypical or multisystem presentations can delay diagnosis and treatment.

Case Presentation: We present the case of a 39-year-old female who was referred to the Emergency Department with the symptoms of diarrhea, palpitations, and restlessness. On examination, she exhibited tachycardia, jaundice, mild pyrexia, and signs of heart failure with anasarca. Laboratory workup revealed severe anemia, pancytopenia, metabolic acidosis, and hyperbilirubinemia. Imaging findings were consistent with goiter, cardiomegaly, hepatomegaly, and ascites. Thyroid function tests showed markedly suppressed TSH and elevated free T3 and free T4 levels, with positive thyroid antibodies. Alongside with a score of 90 on the Burch-Wartofsky scale, the diagnosis of thyroid storm was confirmed. She was admitted to the Intensive Care Unit twice during hospitalization, first for thyrotoxic crisis, and later for sepsis with multiorgan dysfunction. Targeted endocrine, antimicrobial, and supportive therapy led to clinical improvement.

Conclusion: This case underscores the importance of considering thyroid storm in patients with unexplained multisystem involvement. A high index of suspicion, even in the absence of prior thyroid disease, is essential for timely diagnosis and improved outcomes.

Keywords: thyroid storm, thyrotoxicosis, endocrine emergency, multisystem failure, new-onset hyperthyroidism

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Introduction

Thyrotoxic crisis or thyroid storm is a rare, life-threatening endocrine emergency, defined by an instant surge in circulating thyroid hormones in the bloodstream or an increased sensitivity of peripheral tissues to these hormones [1,2]. Despite its low incidence – data from National Surveys from the US and Japan suggest 0.22-0.76 per 100.000 persons per year [3,4]- it carries high mortality rates even with prompt treatment. This hypermetabolic state can be triggered by emotional stress, infection, surgery or trauma and can lead to cardiovascular, gastrointestinal, thermoregulatory or neurological dysfunction, which can culminate in multisystem and organ failure [5].

In view of its severity and the need for immediate medical intervention, thyroid storm requests hypervigilance and multidisciplinary management. This report presents a case of thyroid storm emphasizing the complexity of its presentation and the diagnostic challenge due to overlapping medical conditions.

Case Presentation

A 39-year-old woman with a complex past medical history, listed in Figure 1, and recent emotional stress (bereavement in the summer of 2024), presents to the Emergency Department with diarrhea, fatigue, palpitations, and restlessness. Upon examination, she was alert but anxious, with a Glasgow Coma Scale of 15. Her vital signs were notable for tachycardia (heart rate: 149bpm), hypotension (blood pressure: 100/64 mmHg), mild pyrexia (37.2°C), oxygen saturation of 95% on nasal cannula, and mild tachypnea with pulmonary crackles on auscultation. An irregularly irregular pulse was noted, consistent with atrial fibrillation confirmed on electrocardiogram. Additional findings included abdominal distension without tenderness, scleral and skin icterus, and generalized edema.

Initial laboratory investigations revealed pancytopenia, severe normocytic anemia (Hemoglobin: 6.5 g/dL), hyperbilirubinemia, and metabolic acidosis (pH: 7.2, HCO_3: 9.7 mmol/L, Base Excess: –18.2). The computer tomography (CT) scan of the thorax and abdomen described a diffusely enlarged thyroid goiter, hepatomegaly, cardiomegaly, and ascites. Echocardiography showed preserved left ventricular ejection fraction with signs of congestive heart failure (NYHA class III), moderate Mitral insufficiency, severe Tricuspid regurgitation, and Pulmonary Hypertension. Abdominal ultrasound findings suggested passive hepatic congestion (Figure 2).

Due to the combination of unexplained cardiovascular failure, jaundice, and systemic symptoms, thyroid function testing was performed. Results disclosed suppressed TSH levels (<.0083 μIU/mL), elevated free T3 (12.51 pg/mL) and free T4 (>5 ng/dL), and positive thyroid autoantibodies (TRAb: 26.5 IU/L; Anti-TPO: 721.21 UI/mL; Antithyroglobulin: >1000 IU/mL). The Burch-Wartofsky Point

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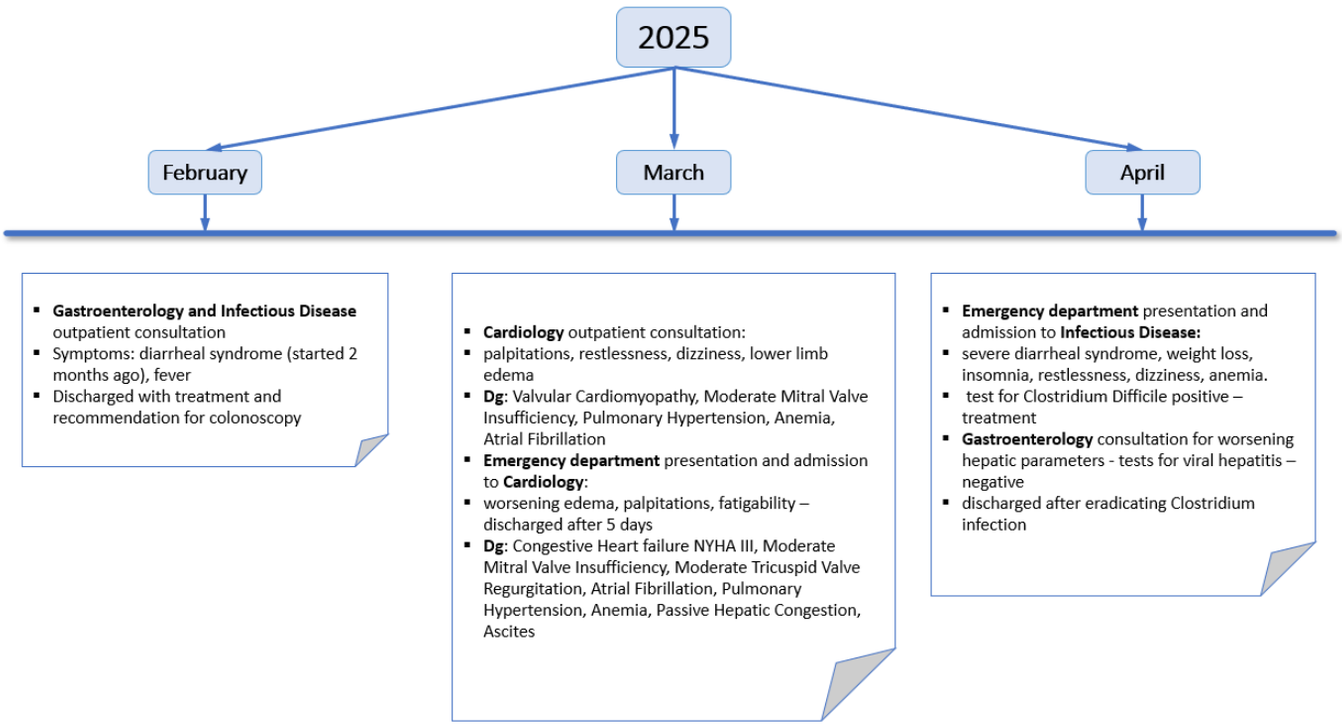

Fig. 1. Patient's Medical History

Scale score was 90, supporting a diagnosis of thyroid storm in the context of newly diagnosed autoimmune hyperthyroidism. She was evaluated for other possible autoimmune diseases through laboratory tests. The results came back negative, with no evidence supporting other cause for the clinical presentation (Table I).

The patient was transferred to the Intensive Care Unit (ICU) for treatment and observation. Due to distributive shock, she required vasopressor support. Antithyroid therapy was initiated with Thiamazole (20 mg every 8 hours) - Propylthiouracil was unavailable - and Propranolol (40 mg every 8 hours). Supportive treatment included correction of acid-base and electrolyte imbalances. A Campylobacter spp. gastrointestinal infection was diagnosed by Multiplex Gastrointestinal Polymerase Chain Reaction (PCR) testing panel and treated accordingly. One unit of packed red blood cells was administered for anemia correction. After six days in the ICU, the patient was hemodynamically stabilized and transferred to the Internal Medicine ward. However, on day 13 of hospitalization, she was readmitted to the ICU with signs of multiorgan dysfunction: respiratory failure, hypotension, jaundice, anuria, generalized edema, and muscle weakness. Laboratory evaluation revealed leukocytosis (WBC 45.81 x10^9/L), acute kidney

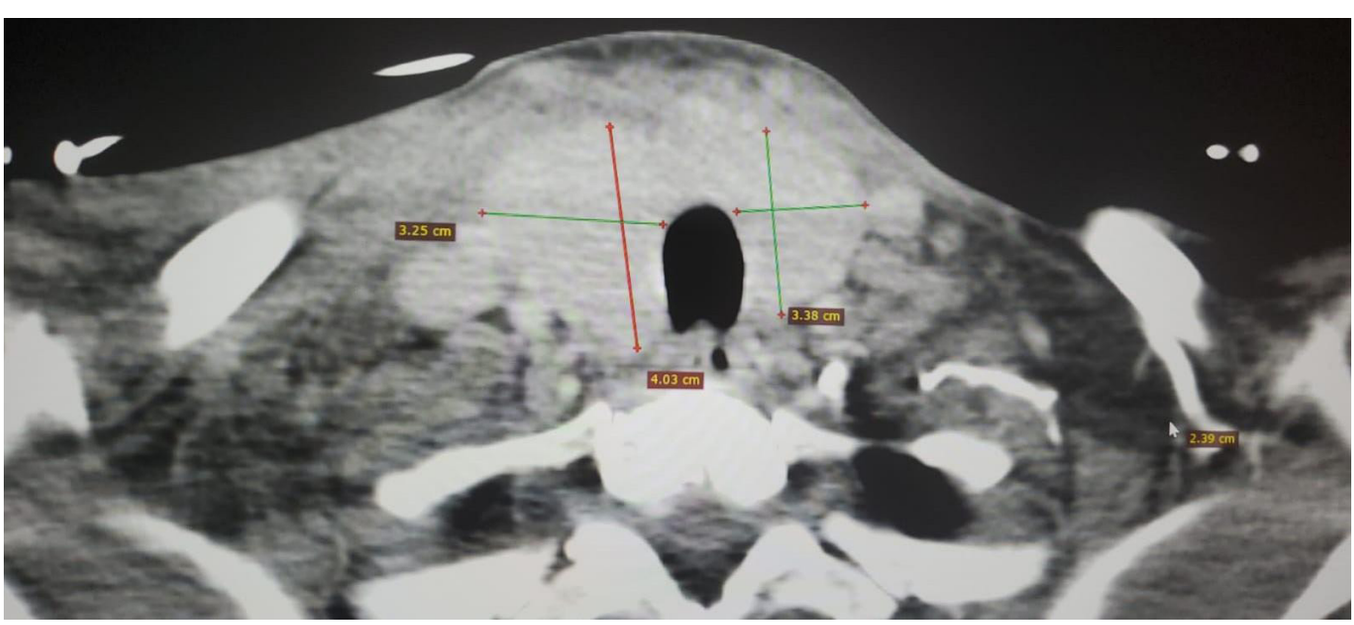

Fig. 2. CT scan of Thyroid Goiter

Table I. Thyroid Panel Results

Thyroid Panel	First ICU admission	
	ICU Admission	Transfer from the ICU
TSH micro UI/ml	< 0.0083	< 0.0083
fT4 ng/dL	> 5	1.51
fT3 pg/dL	12.51	3.52
TRAb UI/L	26.5	
Anti-TPO UI/ml	721.21	578.44
Anti -Thyroglobulin IU/ ml	1000	787.34

Abbreviations: ICU- Intensive Care Unit, TSH- Thyroid-Stimulating Hormone, fT4- Free thyroxine, fT3- Free triiodothyronine, TRAb- thyrotropin receptor antibody, Anti-TPO-Thyroid peroxidase antibodies, Anti-Thyroglobulin- Anti-Thyroglobulin antibody

injury (Creatinine 2.68 mg/dL), elevated inflammatory markers (CRP 165 mg/L, Procalcitonin 0.93 ng/mL), and worsening hyperbilirubinemia (Total Bilirubin 13.7 mg/dL).

Urine cultures isolated Klebsiella spp. and Candida spp., while the Multiplex Respiratory PCR panel confirmed SARS-CoV-2 infection. Antimicrobial and antifungal therapies were initiated and adjusted based on renal function. Due to hepatic and renal insufficiency, antiviral therapy was not administered. Respiratory support was provided with Nasal High-Flow oxygen and cardiocirculatory support with vasoactive agents. Large-volume paracentesis was performed without complications on days 15 and 23, and a chest drain was inserted for right-sided pleural effusion (Figure 3).

Undergoing intensive care support, the patient showed gradual clinical improvement. Inflammatory markers normalized, renal function recovered, and vasoactive support was weaned off. The patient was eventually transferred to the Cardiology department for further evaluation and management. Relevant laboratory results for the first and second ICU admissions are illustrated in Table II.

Discussions

Thyrotoxic crisis is a rare, but potentially fatal exacerbation of hyperthyroidism, characterized by multi-organ and system dysfunction with an estimated in-hospital mortality rate of 10%. [1,6]. In this case, the diagnosis was delayed due to the complexity of the patient's presentation across several specialties in a short time frame, initially obscuring the underlying endocrine etiology. The patient was initially seen by gastroenterology for diarrhea, then by cardiology weeks later for heart failure, atrial fibrillation, and valvular insufficiencies, when she was admitted for treatment though no etiology had been established for the cardiac failure. In April, she was hospitalized for severe diarrhea, weight loss, anemia; Clostridium Difficile was isolated from stool cultures. Gastrointestinal manifestations such as diarrhea or weight loss are well-documented symptoms in hyperthyroid states, likely attributed to high basal metabolic rate or malabsorption, and can mimic primary gastrointestinal pathology independent of infectious processes [11]. Additionally, anemia can occur although the mechanism is less clear. Changes in iron metabolism, increased red blood cell fragility due to oxidative stress can contrib-

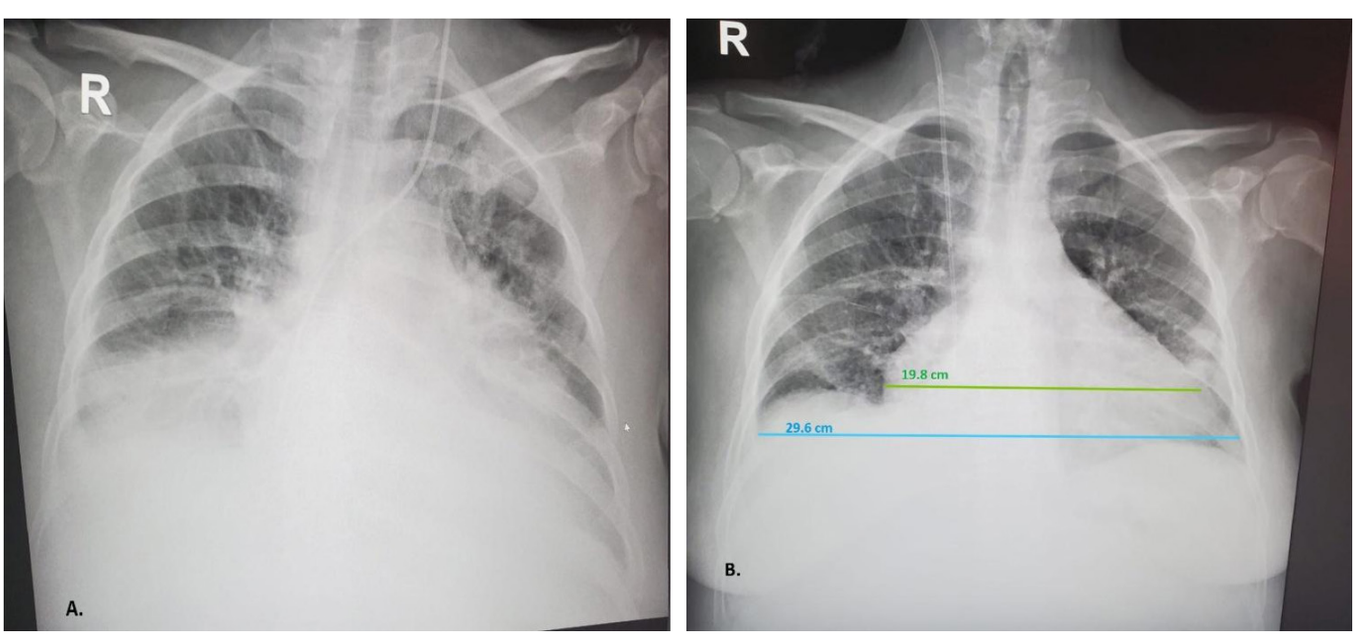

Fig. 3. Relevant Chest X-Rays: A (HD 23) - Moderate right pleural effusion, Small left pleural effusion, Pulmonary congestion, Bilateral infiltrates, Central venous catheter (CVC) with the distal tip in the superior vena cava (SVC); B (HD 30): Small left lateral thoracic consolidation. Right costophrenic angle is clear. CVC with the tip in SVC, Cardiomegaly – cardiothoracic ratio>0.5

Table II. Relevant Laboratory results from the first and second ICU Admission

Lab Results	First ICU Admission		Second ICU Admission	
	HD 1	HD 6	HD 15	HD 23
WBC 10*9/L	3.94	8.61	45.81	16.43
Hemoglobin g/dL	6.5	8.3	9.8	8.1
Hematocrit %	19.8	24.7	28.8	26
PLT 10*3/ul	104	103	288	250
K mmol/L	6.3	3.8	4.8	3.9
Seric Calcium mg/dL	8.4	8.5		
Na mmol/L	139	144	133	145
CRP mg/L		3.5	165	37
PCT ng/ml		0.07	0.93	0.03
Creatinine mg/dL	1.08	1.1	2.68	0.46
Urea mg/dL	185	127	116	13
Direct Bilirubin mg/dL	3.2	4.3	10.5	2.9
Total Bilirubin mg/ dL	3.6	5.4	13.7	3.6
GOT U/L	25	27	38	25
GPT U/L	33	33	17	21

Abbreviations: ICU- Intensive Care Unit, WBC- white blood cell, PLT- Platelets, K- Potassium, Na- Sodium, CRP- C-reactive protein, PCT- Procalcitonin, GOT- serum glutamic oxaloacetic transaminase, GPT- serum glutamic pyruvic transaminase, HD- Hospital Day.

ute to the reduced lifespan of erythrocytes [12]. Cardiovascular manifestations are central to thyroid storm. Thyroid hormones increase myocardial contractility and heart rate, which can lead to tachyarrhythmias, mainly atrial fibrillation, and over time result in heart failure. Pulmonary hypertension, resulting from increased blood volume and venous return, can lead to right ventricular dilation and tricuspid valve incompetence [7,9]. This patient's cardiovascular symptoms were initially managed as isolated heart failure, but clinical deterioration and poor response to conventional medication should have raised suspicion of a possible endocrine cause. Based on the findings presented in the literature, young adults with pulmonary hypertension and heart failure of unclear etiology, should be evaluated for possible hyperthyroidism [8].

The presence of infection in the patient's medical history further complicated the clinical picture. According to a reviewed article, hyperthyroidism can increase susceptibility to infections by heightened sympathetic response, which reduces neutrophil activity and diminishes immune function [10]. Fever and a history of Clostridium Difficile infection suggested a possible recurrence. Although Campylobacter spp. was identified by PCR and infection is a known stressor for thyroid storm, the overall clinical picture couldn't be explained by infection alone.

The diagnosis of thyroid storm was based on clinical findings, laboratory results, and was additionally guide by the Burch-Wartofsky Point Scale [2] which incorporates multisystemic manifestations. The treatment plan followed the recommendations outlined in the 2018 European Thyroid Association Guideline for the Management of Graves' Hyperthyroidism [1].

This case highlights the importance of considering thyroid storm in patients with diverse symptoms—such as gastrointestinal issues, anemia, pulmonary hypertension, infection, liver, and heart failure—to enable timely diagnosis and treatment. Multidisciplinary communication is essential for better management, particularly when symptoms span multiple organ systems.

Conclusions

Thyroid storm is an uncommon yet life-threatening manifestation of hyperthyroidism. Despite characteristic clinical signs, the diagnosis may be challenging due to a broad differential diagnosis, often leading to delayed recognition and treatment, which increases the risk of serious complications and irreversible organ damage.

Ethical statement

The publication of the case was approved (no. 12674/3 from 13.5.2025) by the ethical board of the institution.

Authors' contributions

AKB (Conceptualization, Investigation, Data Curation, Writing – Original Draft, Project Administration)
DJGH (Resources, Visualization, Writing – Review & Editing)
DIM (Investigation, Resources, Writing – Review & Editing)
LA (Supervision, Writing – Review & Editing, Conceptualization)

Conflict of interest

None to declare.

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