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GEMS for JEM



PSYCHIATRIC EMERGENCIES FOR CLINICIANS: THE EMERGENCY DEPARTMENT MANAGEMENT OF THYROID STORM

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CLINICAL SCENARIO

A 54-year-old white woman with a history of depression is brought to the Emergency Department by police on an involuntary mental health hold secondary to out-of-control behavior. Police were contacted by her daughter, who reports the patient has not been sleeping and has become increasingly agitated. History is difficult to obtain, as on examination, her speech is pressured and illogical. Her daughter describes her behavior as a dramatic change over the last few days. On review of systems, she has a worsening cough and shortness of breath, fever, and 4 kg (~9 lb) weight loss over the last few weeks. She appears jittery on observation, is pacing within the examination room, has a noticeable tremor, and is profusely diaphoretic. She also has a nonproductive cough. On physical examination, her vital signs include a temperature of 39.5°C (103°F), a heart rate of 135 beats/min, a blood pressure of 160/75 mm Hg, and a respiratory rate of 20 breaths/min, with an oxygen saturation of 96%. Her skin is noted for erythema and her

palms are damp. Her lower extremities are notable for pitting edema. An electrocardiogram shows sinus tachycardia. Urine toxicology is negative. Metabolic panel and blood count are remarkable for leukocytosis (14.2 cells/L), hypercalcemia (11.7 mg/dL), and elevated transaminases (AST 287 U/L, ALT 245 U/L). She is oriented only to person. She becomes irritable with continued assessment and reports she needs to leave the hospital to give a presentation on world peace to the United Nations. When told she cannot leave, she becomes agitated and assaults a staff member, requiring physical restraints.

What Do You Think is Going on With the Patient?

The clinical presentation strongly suggests thyroid storm (TS) or extreme thyrotoxicosis, a term indicating the physiologic effects of elevated thyroid hormone concentrations (1). Many sources reserve the term “hyperthyroidism” to refer to conditions that cause elevated thyroid hormone, and so the term “thyrotoxicosis,” a common endocrine metabolic disorder with a prevalence of approximately 1.2% in the United States, is used here (2). TS, as seen in this case, is rare, though the mortality may be as much as 25%, even with adequate treatment (3,4).

What Key Findings Lead to Diagnosis?

Though much of her history and examination are consistent with bipolar mania, there are many other clues that suggest a diagnosis of TS. Hyperthermia occurs in almost all cases of TS (5). Peripheral edema is indicative of the cardiac decompensation, typically high-output heart failure, which can occur (6). Additionally, her tachycardia, heat intolerance, weight loss in the presence of increased appetite, tremor, weakness, and skin erythema are all clues pointing towards thyrotoxicosis (7). Other signs of end-organ dysfunction that can occur in TS include neurological dysfunction, such as delirium or, as in this case, mania, renal impairment, and hepatic impairment in the form of transaminitis and, in some cases, jaundice (6). Leukocytosis and hypercoagulability may also be seen, with as many as 18% of deaths attributed to thromboembolic complications (8). Table 1 shows the diagnostic criteria for TS, developed by Burch & Wartofsky in 1993 (9). Applying the criteria to this case yields a score highly suggestive of TS. Alternatively, a recent study by Akamizu et al. has reported diagnostic criteria based on Japanese nationwide surveys with thyrotoxicosis and four additional symptoms: central nervous system manifestations, temperature $\geq 38.0^{\circ}\text{C}$, tachycardia (≥ 130 beats/min), and gastrointestinal-hepatic manifestations (10). The presence of at least three symptoms and thyrotoxicosis is considered a “definite” diagnosis, though if free thyroid values are not available, the diagnosis of TS is only “suspected” (3,10).

TS is most commonly seen in woman aged 30–50 years with a personal history of thyroid or autoimmune disorders, particularly Graves disease (6,7). Other high-risk populations include smokers, women in the peripartum period, and patients recovering from immunosuppression (7). Often, elderly patients will present atypically with minimal signs of thyrotoxicosis and the primary symptom being apathy. Stupor, heart failure, and coma are all more likely in this population (6). A recent cross-sectional study found that a majority of thyrotoxic patients over age 61 years had fewer than three classic symptoms (11).

WHAT OTHER DIAGNOSES SHOULD YOU CONSIDER?

Since thyroid hormones affect nearly every organ system, patients can have numerous different presentations ranging from atrial fibrillation to paralysis, the latter of which is more common in Asian populations (12). Less often discussed is the fact that TS may mimic primary psychiatric illnesses such as psychosis or bipolar mania (4,13,14). Psychosis was first associated with hyperthyroidism by Von Basedow in 1840, and there

Table 1. Diagnostic Criteria for Thyroid Storm (9)

Clinical Feature	Scoring Points	
Thermoregulatory Dysfunction		
Temperature °F (°C)		
99–99.9 (37.2–37.7)	5	Total score ≥ 45 : Highly suggestive of thyroid storm 25–44: Suggestive of impending storm < 25: Storm unlikely
100–100.9 (37.8–38.2)	10	
101–101.9 (38.3–38.8)	15	
103–103.9 (39.5–39.9)	20	
≥ 104 (40)	25	
Cardiovascular dysfunction		
Tachycardia (beats/min)		
<99	0	
99–109	5	
110–119	10	
120–129	15	
130–139	20	
≥ 140	25	
Signs of heart failure		
Absent	0	
Mild (pedal edema)	5	
Moderate (bibasilar rales)	10	
Severe (pulmonary edema)	15	
Atrial fibrillation		
Absent	0	
Present	10	
Central nervous system dysfunction		
Absent	0	
Mild (agitation)	10	
Moderate (psychosis/mania, delirium, extreme lethargy)	15	
Severe (seizure, coma)	20	
Gastrointestinal and hepatic dysfunction		
Absent	0	
Moderate (abdominal pain, nausea/vomiting, diarrhea)	10	
Severe (unexplained jaundice)	20	
Prior episodes		
No	0	
Yes	10	

have been multiple case reports since that time (15–18). TS can also mimic acute cocaine intoxication or present as excited delirium (19,20). In rare cases, TS can be present in trauma and almost indistinguishable from traumatic hypovolemic shock (21). Thus, the differential is broad. However, it is critical to recognize the illness and treat it appropriately given the high mortality (3,4).

The most common cause of TS is Graves disease, particularly in areas of adequate iodine intake, with the classic presentation occurring postthyroidectomy for hyperthyroid states (6,22). This complication occurs much less frequently now as guidelines recommend patients be rendered euthyroid prior to surgery using modern treatment modalities (23). Regardless of the etiology of underlying hyperthyroid state, escalation to TS typically

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