

EM CASE OF THE WEEK

BROWARD HEALTH MEDICAL CENTER DEPARTMENT OF EMERGENCY MEDICINE



Thyroid storm is an acute and life-threatening emergency. The adult mortality rate is extremely high if early diagnosis is not made and the patient is left untreated. Early recognition and treatment in the ED can save lives!

EM CASE OF THE WEEK

EM Case of the Month is a monthly “pop quiz” for ED staff. The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.



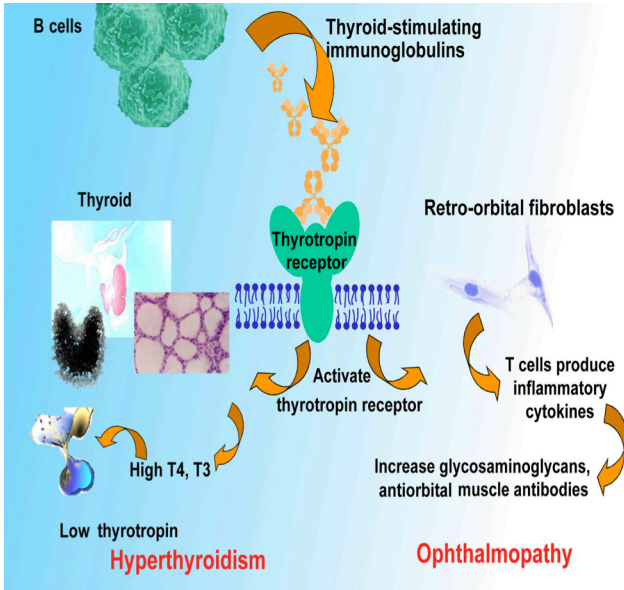
“The Perfect Storm”

A 33 year old female is brought to the emergency department via ambulance after developing palpitations, dizziness and lightheadedness while standing at work a few hours ago. Her vital signs are T 97, HR 132, RR 20, BP 145/87, O2 sat 99%. On further questioning, she states that her past medical history consists only of hyperthyroidism, however she has not been taking her medications for over a year because she lost her insurance and cannot afford them. On physical exam, a palpable goiter is felt. An ECG confirms Atrial Fibrillation with rapid ventricular response. Bloodwork reveals a TSH of <0.01 and a T4 of 23.91 and a positive d-dimer. Which of the following is NOT true regarding thyroid storm?

- A. Thyroid storm is usually precipitated by events such as surgery, infection or a pulmonary embolus.
- B. There is a scoring system in place that is the standard of practice when diagnosing thyroid storm.
- C. Thyroid storm can be the initial sign of hyperthyroidism in undiagnosed children.
- D. Thyroid storm is a hypermetabolic state affecting multiple organ systems and is the most extreme form of hyperthyroidism
- E. In the past, thyroid storm was most commonly a surgical emergency that occurred while operating on the thyroid gland.



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Thyroid Storm

The correct answer is B. Burt and Wartofsky proposed a scoring system that serves as a guideline for diagnosing thyroid storm. However, the diagnosis is primarily a clinical one. The classic triad of thyroid storm consists of high fevers, tachycardia and altered mental status.

Introduction:

Thyroid storm is a life-threatening emergency that requires immediate attention and treatment. In the past, thyroid storm had a mortality rate of almost 90%. The improvements in management of hyperthyroidism and early detection of thyroid storm have recently decreased the mortality rate to about 20% in treated patients. Oftentimes admission to an intensive care unit is warranted.

Take Home Points

- Thyroid storm is a rare, yet life-threatening medical crisis. A high index of suspicion is important.
- The symptoms in thyroid storm are similar to those seen in uncomplicated hyperthyroidism, however even more severe.
- The diagnosis is a clinical one, and the Burt and Wartofsky scoring system should be used as a guideline. Admission into the ICU is often necessary.
- PTU is preferred over methimazole in the treatment of thyroid storm. Wait **at least 1 hour after** administering PTU to administer iodine in order to effectively block the release of new thyroid hormone.

Diagnostic criteria for thyroid storm*

Thermoregulatory dysfunction		Cardiovascular dysfunction	
Temperature (°F °C)		Tachycardia	
99 to 99.9 37.2 to 37.7	5	99 to 109	5
100 to 100.9 37.8 to 38.2	10	110 to 119	10
101 to 101.9 38.3 to 38.8	15	120 to 129	15
102 to 102.9 38.9 to 39.4	20	130 to 139	20
103 to 103.9 39.4 to 39.9	25	≥140	25
≥104.0 >40.0	30	Atrial fibrillation	10
Central nervous system effects		Heart failure	
Mild	10	Mild	5
Agitation		Pedal edema	
Moderate	20	Moderate	10
Delirium		Bibasilar rales	
Psychosis		Severe	15
Extreme lethargy		Pulmonary edema	
Severe	30	Precipitant history	
Seizure		Negative	0
Coma		Positive	10
Gastrointestinal-hepatic dysfunction			
Moderate	10		
Diarrhea			
Nausea/vomiting			
Abdominal pain			
Severe	20		
Unexplained jaundice			

* A score of 45 or more is highly suggestive of thyroid storm; a score of 25 to 44 supports the diagnosis; and a score below 25 makes thyroid storm unlikely. Adapted from: Burch HB, Wartofsky L. Life-threatening thyrotoxicosis. *Thyroid storm*. *Endocrinol Metab Clin North Am* 1993; 22:263.

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Pathophysiology. Thyroid storm is a severe hypermetabolic state induced by the thyroid hormone. The clinical picture relates to exaggerated effects of thyroid hormone (TH) due to increased release of TH. It is the most severe extreme of hyperthyroidism.

An increase in the peripheral circulation of unbound thyroid hormone can cause hyperthyroidism. Disturbances of the normal homeostatic mechanism can occur at the level of the pituitary gland, the thyroid gland, or in the periphery. Regardless of etiology, the result is an increase in the basal metabolic rate. Signs and symptoms of hyperthyroidism resemble a state of catecholamine excess.

Graves' disease is the most common cause of hyperthyroidism. In Graves' disease, circulating autoantibodies against the thyrotropin receptor provide continuous stimulation of the thyroid gland. These antibodies cause release of thyroid hormones and thyroglobulin, and they also stimulate iodine uptake, protein synthesis, and thyroid gland growth.

Symptoms associated with thyroid storm include tachycardia, atrial fibrillation, hypotension/hypertension, CHF, hyperpyrexia, severe nausea, vomiting, diarrhea, jaundice, hepatic failure, delirium, stupor and coma.

Risk Factors.

Risk factors include long-standing untreated hyperthyroidism, thyroid or non-thyroidal surgery, trauma, infection, an acute load of iodine, parturition and irregular use or discontinuation of anti-thyroid medications. It is unclear why certain factors result in the development of thyroid storm. Hypotheses include a rapid rate of increase in serum thyroid hormone levels, increased responsiveness to catecholamines, or enhanced cellular responses to thyroid hormone

Diagnosis. There are no universally accepted criteria or validated clinical tools for diagnosing thyroid storm. In 1993, Burch and Wartofsky introduced a scoring system using precise clinical criteria for the identification of thyroid storm.

A score of 45 or higher is suggestive of thyroid storm, whereas a score below 25 makes thyroid storm unlikely. A score of 25 to 44 suggests impending storm. While this scoring system is sensitive, it is not very specific. Thyroid function tests (TSH) should be assessed in all patients. If the TSH is below normal, free T4 and T3 should be measured. The degree of hyperthyroidism (elevation of T4 and/or T3 in patients with thyroid storm is generally comparable to that in patients with uncomplicated hyperthyroidism. The degree of hyperthyroidism is not a criterion for diagnosing thyroid storm. Thyroid storm can also cause mild leukocytosis with a left shift, elevated LFTs and hypercalcemia.

Treatment. Admit the patient into an ICU setting for close monitoring and to facilitate the use of inotropic support if needed. Immediately provide supplemental oxygen, ventilatory support, and IV fluids as needed. Dextrose solutions are the preferred intravenous fluids. Correct electrolyte abnormalities. Treat any cardiac arrhythmia, if necessary (B-blocker for rate control ie. propranolol). Aggressively control hyperthermia.

Correct the hyperthyroid state. Administer antithyroid medications to block further synthesis of thyroid hormones: High-dose propylthiouracil (PTU) is preferred because of its early onset and ability to inhibit peripheral conversion of T4 to T3. At least 1 hour after starting anti-thyroid medications, administer iodine compounds orally or via a nasogastric tube to block the release of thyroid hormones. Administer glucocorticoids to decrease peripheral conversion of T4 to T3. Treat the underlying condition, if any, that precipitated thyroid storm. Rarely, as a life-saving measure, plasmapheresis has been used to treat thyroid storm. Iodine preparations should be discontinued once the acute phase resolves. If the patient is given PTU during treatment of thyroid storm, this should be switched to methimazole at the time of discharge unless methimazole is contraindicated.

ABOUT THE AUTHOR:

This month's case was written by Benita Chilampath. Benita is a 4th year medical student from NSU-COM. She did her emergency medicine rotation at BHMC in August 2015. Benita plans on pursuing a career in Internal Medicine after graduation.

