

Diagnosis and Management of Thyroid Storm

Recently I took part in the care of a 35 year-old female patient who presented to the emergency department worried about a growing mass on the right side of her neck. The patient had a history of hyperthyroidism (being treated with methimazole) and had all the symptoms of increased circulating thyroid hormone, including diaphoresis, weight loss, increased appetite, tremulousness, etc. On exam she was mildly tachycardic and had a palpable mass (around 5x5cm) on the right side of her neck. Her TSH came back low and her reflex T4 was elevated. Due to these signs/symptoms and lab results, the patient was sent for a CT scan to rule out a thyroid mass. After the patient returned from the scan, she became tachycardic in the 170s, as well as extremely anxious with tremors and chest pain. The patient was moved to the booth for further management. She was diagnosed with thyroid storm, and the patient was managed as so. What are the keys to diagnosing thyroid storm and how is it treated?

It is a **clinical diagnosis**. The symptoms are the same as **hyperthyroidism taken to the extreme**. Patients are typically tachycardic >140 bpm. Other CV effects include heart failure, hypotension, arrhythmias, and death. They are usually febrile and have some form of agitation, anxiety, delirium, or psychosis. They can eventually become stuporous or fall into a coma. GI complaints are also common: N/V/D, abdominal pain, and hepatic failure/jaundice; however, there are no criteria that are accepted universally. **One tool to use**, developed by Burch and Wartofsky, utilizes a point system assigned to clinical signs and symptoms. A score between 25 and 44 is considered supportive of the diagnosis for thyroid storm. Greater than 45 is considered highly suggestive.

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		Mild	
Agitation	10	Pedal edema	5
Moderate		Moderate	
Delirium	20	Bibasilar rales	10
Psychosis		Severe	
Extreme lethargy		Pulmonary edema	15
Severe		Precipitant history	
Seizure	30	Negative	0
Coma		Positive	10
Gastrointestinal-hepatic dysfunction			
Moderate			
Diarrhea	10		
Nausea/vomiting			
Abdominal pain			
Severe			
Unexplained jaundice	20		

* 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.

Our patient would have scored a 55, scoring points for agitation, abdominal pain, tachycardia >140, and a precipitant (iodinated contrast). So now you have the diagnosis, how do you treat the patient to prevent them from having cardiovascular collapse?

Beta blockers decrease the symptoms caused by increased adrenergic tone. Propranolol is usually the first line with a 0.5-1 mg dose given over 10 minutes then 1-2 mg given over 2 minutes every couple of hours. Metoprolol and atenolol (cardioselective) can be used in patients with reactive airway disease. Also, a **thionamide** (methimazole 20 mg q4-6h or propylthiouracil 200 mg q4h) should be given to block the synthesis of new hormone. An extensive literature search showed

no trials proving one thionamide more effective than the other. Choice of which to use is based upon clinician preference; however, keep in mind that PTU blocks conversion of T4 to T3 but is hepatotoxic and methimazole is longer-acting than PTU. **Iodine (Lugol's solution)** can also be given to block the release of hormone from the thyroid gland. This is through the Wolff-Chaikoff effect where an increased iodine concentration leads to a decrease in T4 and T3. Make sure to give the iodine at least **one hour after giving the thionamide**. If given right away, the iodine can actually lead to increased production of thyroid hormone through the Jod-Basedow effect. **Glucocorticoids** (hydrocortisone 100 mg IV q8h) also should be given to treat possible adrenal insufficiency. They also prevent the conversion of T4 to T3. Lastly, it is imperative to know **what caused the storm and to treat the cause**. For example, find and treat their infection. Get them on the right dose of PTU/methimazole, etc.

References / Further Reading

- Donaldson MD, Ross, et. al. "Thyroid Storm." WikEM. 13 Jun 2014.
- Ross MD, Douglas. "Thyroid Storm." UpToDate. 06 Dec 2013.
- <http://www.ncbi.nlm.nih.gov/pubmed/24766938>
- <http://www.ncbi.nlm.nih.gov/pubmed/24766932>
- <http://www.ncbi.nlm.nih.gov/pubmed/24176474>