

## Case Report

# Thyroid storm: extreme remedies for extreme diseases

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## ABSTRACT

Thyroid storm is a hypermetabolic state due to acute elevation of thyroid hormones precipitated by multiple causes. It's a rare life threatening emergency, and failure of prompt aggressive treatment will lead to multiorgan dysfunction and complicate further treatment plans. In this report we described our experience of managing a severe thyroid storm patient with contraindication to carbimazole, the complexities encountered with conventional treatment methods and alternative aggressive remedy options.

**Keywords:** Thyroid storm, Antithyroid contraindications, Plasmapheresis, Thyroidectomy

## INTRODUCTION

Hyperthyroidism is a state of elevated thyroid hormone levels in blood leads to increased beta adrenergic manifestation. Thyroid storm (TS) is an acute, life-threatening, hyper metabolic state induced by excessive release of thyroid hormones in individuals with thyrotoxicosis. Only 1%-2% of people with hyperthyroidism will develop TS, but the mortality rate for patients with untreated TS ranges from 50% - 90%.<sup>1,2</sup> With early intervention, mortality drops to less than 20%.<sup>3</sup> Management of thyroid storm is complex and it varies in each case. We report a case of severe TS in our center highlighting on complexities we encountered and alternative management options.

## CASE REPORT

A 33 year old female presented to ED with complain of two days fever, generalized weakness and palpitation of a

week duration associated with nausea and vomiting. She was diagnosed as Grave's hyperthyroidism since 5 months ago and started on carbimazole. A month ago she was hospitalized for neutropenic sepsis due to carbimazole induced agranulocytosis. Her treatment was with held since a fortnight ago and was planned for radioactive iodine therapy in two weeks time. Meanwhile she was discharged with propranolol 40 mg bd while waiting for the radioactive iodine therapy. On examinations she appeared lethargic, jaundiced and tachypneic with respiratory rate of 30 and disorientated. Her blood pressure was 80/50, heart rate 120 and temperature 40C°. Respiratory and abdominal examination revealed no abnormalities. Her initial blood investigations in ED showed WBC 10 x 10<sup>9</sup>/L, urea 15 mmol/L, Creatinine 200µmol/L and deranged liver function test (ALT 114u/l, ALP 287u/l, AST 1898u/l). While on going fluid resuscitation in ED patient developed supraventricular tachycardia which aborted with IV adenosine 6mg x 2. Her blood gases showed

severe metabolic acidosis. She was intubated in ED due to altered GCS with severe metabolic acidosis.

Initial Burch-Wartofsky score was calculated as 75 (Table 1) and she was treated for thyroid storm. Prophylthiouracil was started with high dose, 200mg QID together with lugols iodine and steroids. Thyroid function test consistent with thyroid storm with high T3 (80pg/mL). She was empirically covered with IV rocephine and required ionotropic support for more than a week. Her liver function test were rising in trend during the initial five days and subsequently reducing in trend. On day 6 she developed persistent fast AF and treated with digoxin. Digoxin was withheld after few days due to digoxin induced bradycardia. Her thyroid function test showed improvement (T3 8.8 pg/ml, T4 >64 and TSH <0.01) with PTU 200mg QID. Subsequently her prophylthiouracil dose was tapered down to 150mg BD.

**Table 1: Burch - Wortofsky score calculation on admission.**

Criteria	Score
Temperature - 40C°	25
Gastrointestinal/ Hepatic - Moderate	10
Central Nervous System effect - Moderate	10
Cardiovascular - Heart rate 110-119bpm	10
Congestive Heart Failure	0
Atrial Fibrillation	10
Precipitant - Medication discontinued	10
<b>Total Score</b>	<b>75</b>

We were unable to extubate her despite low ventilator support due to generalise muscle weakness with power 2/5. Subsequently patient developed bleeding tendencies due to deranged coagulation profile and severe thrombocytopenia secondary to antibody. Endocrinologist suggested for thyroidectomy in view of deranging liver function test possibly due to thyroid storm itself or drug induced by prophylthiouracil. Persistent deranged coagulation profile and thrombocytopenia made the patient not a suitable candidate for surgery. The patient's condition subsequently worsened and she passed away on day 31 in ICU.

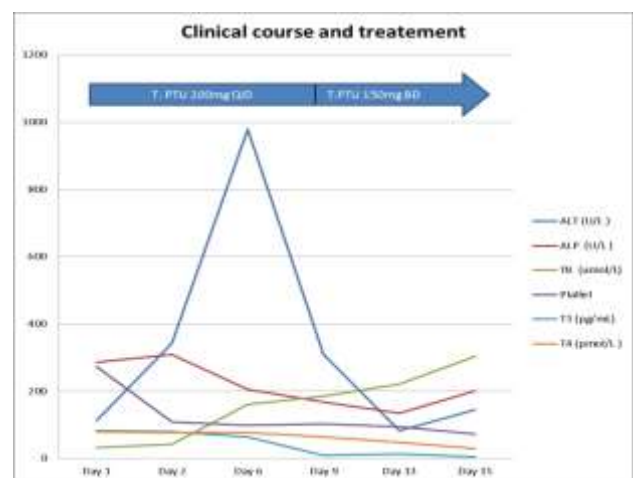
**DISCUSSION**

Why hyper stimulation of thyroid hormone is called thyroid 'storm'? Witnessing a thyroid storm case will enable us to answer this question. TS affect normal physiologic function of every organ systems leading to multiorgan dysfunction (MODS) upon failure of initiating an early aggressive management.

TS occur in 1-2% of patients with hyperthyroidism. It may occur in normal thyroid function patients. The most common precipitating cause of thyroid storm is poor control of hyperthyroidism which was also the cause in our case. There are few useful tools for eliciting a diagnosis of thyroid storm based on clinical evaluation such as Burch and Wartofsky score. Despite the usefulness of this score the diagnosis maybe delayed on account of variable presentation resulting in mortality of 60-100%. Even though we diagnosed and initiated treatment early in our patient we were unable to achieve a successful outcome. In this report we would like to highlight how can we improve the treatment aspects incorporating various aggressive treatment strategies based on latest literature review.

**Alterative medical therapy**

In TS prompt treatment should be initiated on suspicion, without waiting for thyroid function test. High-dose propylthiouracil (PTU) is the preferred choice in TS because of its early onset of action and capacity to inhibit peripheral conversion of T4 to T3. FDA has identified 32 cases (22 adult and 10 pediatric) of serious liver injury associated with PTU. In our patient we have observed worsening of liver function since the admission to ICU (Figure 1), but unable to differentiate whether it's due to the disease process or PTU induce. PTU dose was successfully weaned down after day 3 when the T3 reducing in trend. Complicating factor in assessing liver injury due to antithyroid medications is that hyperthyroidism itself can be associated with serum enzyme elevations and mild jaundice. In most instances, recovery is rapid once PTU was stopped with first sign of clinically apparent liver injury. In our patient we were in doubt so we did continued PTU with lower dose, outweigh the risks of discontinuation. In literature use of lithium iodine in patients' with thiomides contraindication was described, but the evidence is limited. In this group of patients either plasmapheresis or thyroidectomy will be a wise choice.



**Figure 1: Clinical course and treatment with T. prophylthiouracil during the initial stay in ICU.**

### **Plasmapheresis**

Antibody testing towards thyroid during TS is not a common practice in our center. Few reports available on positive antibody testing during thyroid storm. On day 15 we detected positive antibody against platelet when investigated for persistent thrombocytopenia. Raised tri-iodothyronine levels associated with shortened platelet survival and accelerated clearance of heat damaged red cells from the circulation, suggesting that thrombocytopenia in TS maybe the consequences of peripheral sequestration of antibody coated cells in the reticuloendothelial system.<sup>4</sup> At this moment plasmapheresis would have been a better treatment option. Plasmapheresis was successfully used in few case reports in clinical situations which prohibit the use of traditional treatment methods. The action of plasmapheresis mainly results from plasma removal of cytokines, putative antibodies, and thyroid hormones and their bound proteins. Few reports have documented improvement of neurologic symptoms on early initiation of plasmapheresis. This treatment might have changed the outcome in our patient if employed early.

### **Thyroidectomy**

Emergent thyroidectomy has been shown to be a safe method for treating TS. Thyroidectomy in hyperthyroid state is always a huge concern for surgeons and anesthesiologists. Ideally thyroidectomy can be performed 7 days after TS when the medical therapy achieved a euthyroid state. In TS the time taken for decision making is crucial because further delay will leads to MODS resulting in an unsuitable state for surgery. The successful surgical management of patients in thyroid storm, without obtaining euthyroid status prior to the procedure, has been reported.<sup>5</sup> Early thyroidectomy

should be considered as an alternative treatment strategy after a multidisciplinary discussion in severe TS.

### **CONCLUSION**

TS as the name depicts has a detrimental effect in inadequately treated patients. A well planned treatment strategy since the beginning will yield a successful outcome. Aggressive strategies such as plasmapheresis and early surgery should always come into consideration when dealing with severe TS.

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