Thyroid Emergencies

Storm & myxedema coma · Both are clinical diagnoses — treat before the labs return

ORDER MATTERS
thionamide before iodine

THYROID STORM — RECOGNIZE IT *decompensated thyrotoxicosis, not just a high free T4*

THE PICTURE

Fever (often > 38.5°C) · **tachycardia out of proportion**, often with atrial fibrillation or high-output failure · **agitation, delirium, seizure or coma** · **nausea, vomiting, diarrhea, jaundice**. **Severity does not track the hormone level** — the labs may look like ordinary thyrotoxicosis.

SCORE IT

Burch-Wartofsky points score across thermoregulatory, CNS, gastrointestinal-hepatic, and cardiovascular systems, plus a precipitant. **≥ 45 is highly suggestive**, 25–44 impending. It is a **prompt to treat, not a gatekeeper** — treat a convincing clinical picture regardless.

FIND THE TRIGGER

Infection · surgery or thyroid manipulation · **iodinated contrast** or amiodarone · **stopping antithyroid drugs** · radioiodine · trauma, labour, or diabetic ketoacidosis.

TREAT THE STORM *five drugs, and the sequence is not optional*

1. **Thionamide first. *Propylthiouracil* is generally preferred in storm** because it is more effective over the first 24 hours and additionally **blocks peripheral conversion of T4 to T3**. Methimazole is the safer drug overall and is a reasonable alternative outside crisis.
2. **Iodine — but only AFTER the thionamide.** Give **SSKI or Lugol solution roughly an hour later**, then every 6 hours. Iodine blocks release of preformed hormone. **Giving iodine first supplies substrate for new hormone synthesis and can worsen the storm.**
3. **Beta-blocker** for any suspected storm — controls the adrenergic state, and propranolol additionally impairs T4-to-T3 conversion at higher doses. Use with care, and with hemodynamic monitoring, if there is high-output cardiac failure.
4. **Corticosteroids** — **hydrocortisone 100 mg IV every 8 hours** (about 300 mg/day) or dexamethasone. They reduce peripheral conversion and cover possible coexisting relative adrenal insufficiency.
5. **Supportive care and the precipitant.** Cooling with acetaminophen and external measures — **avoid aspirin**, which displaces thyroid hormone from binding proteins and raises the free fraction. Fluids, electrolytes, and treat the trigger. **Escalate to critical care.**

MYXEDEMA COMA — THE OPPOSITE EMERGENCY *hypothermia, hypoventilation, hyponatremia*

RECOGNIZE IT

Hypothermia (may be profound, and fever may be absent even with sepsis) · **depressed consciousness** · **hypoventilation with hypercapnia** · **hyponatremia** · bradycardia and hypotension · non-pitting edema, macroglossia, and a thyroidectomy scar. Precipitated by **cold, infection, sedatives, or stopping levothyroxine**.

TREAT IT

Give hydrocortisone BEFORE thyroid hormone — thyroid replacement accelerates cortisol metabolism and can precipitate adrenal crisis if there is coexisting adrenal insufficiency. Then **IV levothyroxine**, with **liothyronine (T3)** added in selected severe cases. Add **passive rewarming**, ventilatory support, cautious fluids, and treatment of the precipitant. **Do not rewarm aggressively** — peripheral vasodilation causes collapse.

THE LABS *send them, then act without waiting*

Test	Interpretation
TSH, free T4, free T3	**Suppressed TSH with raised free hormones** in storm; **raised TSH with low free T4** in primary myxedema. A **low or normal TSH with low free T4** suggests central hypothyroidism — check the pituitary axis.
Cortisol	Send **before** giving steroids where possible, but **never delay treatment** for the result in either emergency.
Supporting labs	Complete blood count, cultures, glucose, electrolytes, **creatine kinase** (raised in myxedema), liver function, and an **arterial blood gas** for hypercapnia in myxedema coma.
Cardiac	ECG and troponin. Storm commonly precipitates **atrial fibrillation** and demand ischemia; myxedema causes bradycardia, low voltages, and prolonged QT.

WHEN THE STORM WILL NOT SETTLE *escalation options*

Option	When to reach for it
Plasma exchange	Removes circulating hormone and binding proteins. For **storm refractory to maximal therapy**, or where thionamides are contraindicated.
Emergency thyroidectomy	For failure of medical therapy or life-threatening thionamide toxicity. Requires **prior stabilization**, typically with iodine and steroids, and an experienced surgical team.
Definitive therapy afterwards	Once stable, plan **radioiodine or surgery**. Note that **radioiodine can transiently worsen thyrotoxicosis**, so patients are usually rendered euthyroid on a thionamide first. Storm should never be discharged on a thionamide alone with no plan.
Thionamide toxicity	Warn every patient about **agranulocytosis** — sore throat and fever means **stop the drug and check a complete blood count immediately**. Propylthiouracil additionally carries a risk of **severe hepatotoxicity**, which is why methimazole is preferred outside crisis and pregnancy's first trimester.

AMIODARONE-INDUCED THYROTOXICOSIS *two types, opposite treatments*

TYPE 1 — iodine-induced excess synthesis

Occurs in a gland with **underlying nodular disease or latent Graves**. There is increased vascularity on Doppler. **Treated with thionamides**, sometimes with perchlorate.

TYPE 2 — destructive thyroiditis

Occurs in a **normal gland**, with reduced vascularity on Doppler and preformed hormone released by destruction. **Treated with corticosteroids.** Mixed pictures are common, so many patients receive both while endocrinology advises. **Whether to stop amiodarone is a joint decision with cardiology** — its long half-life means the effect persists for months either way.

PEARLS & PITFALLS

- **Never give iodine before a thionamide.** Iodine given first fuels new hormone synthesis and can make the storm worse.
- **Hormone levels do not grade severity.** Storm is a clinical diagnosis, and the free T4 may be no higher than in stable thyrotoxicosis.
- **Avoid aspirin for the fever** — it displaces hormone from binding proteins.
- **Steroids before levothyroxine** in myxedema coma, every time, or you risk precipitating adrenal crisis.
- **Absence of fever does not exclude infection** in myxedema coma — these patients cannot mount a temperature. Culture and cover empirically.
- **Amiodarone causes both** hyper- and hypothyroidism — check the drug chart.

References: Burch-Wartofsky point scale and its updated review · American Thyroid Association guidance on hyperthyroidism and thyrotoxicosis · JCEM, Approach to the patient with thyroid storm.

Educational aid; verify doses against local protocol, hepatic and cardiac function, and patient factors.

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