CONDITION

Thyroid storm

Thyroid storm is a sudden, life-threatening worsening of an overactive thyroid.

WHAT IT IS
Extreme body-wide effects of excess thyroid hormone

BODY SYSTEM
Hormones, heart and circulation, brain, and digestive system

MAIN SYMPTOMS
High fever, very fast heartbeat, agitation, vomiting

WHAT CAUSES IT
Severe hyperthyroidism plus triggers such as infection or surgery

HOW IT IS DIAGNOSED
Clinical assessment supported by thyroid hormone and TSH blood tests

MAIN TREATMENT
Emergency medicines, cooling, fluids, and treatment of the trigger

CAN IT BE CURED?
Yes - the crisis can resolve with emergency treatment

IS IT AN EMERGENCY?
Yes - immediate hospital treatment is always needed

LONG-TERM OUTLOOK
Often good after recovery; untreated cases can be fatal

Overview

Thyroid storm is a rare but life-threatening complication of an overactive thyroid, also called hyperthyroidism. It happens when excess thyroid hormone has an extreme effect on several parts of the body at once.

Thyroid hormones help control how quickly the body uses energy. Too much can make the heart beat faster, raise body temperature, disturb digestion, and affect thinking and behaviour. During thyroid storm, these effects become severe enough that organs may start to fail.

Thyroid storm does not always mean that thyroid hormone levels suddenly become much higher. People with thyroid storm may have levels similar to those seen in less severe hyperthyroidism. The diagnosis is based mainly on how ill the person is and which organs are affected.

The condition needs immediate hospital treatment, often in an intensive care unit. With prompt treatment, the crisis can resolve. The underlying thyroid condition will still need ongoing care to reduce the risk of another episode.

Symptoms

Symptoms usually develop quickly and affect several body systems. They are more severe than the usual symptoms of an overactive thyroid.

Common features include:

Some older adults may not appear agitated. Instead, they may become unusually quiet, weak, withdrawn, confused, or sleepy. This is sometimes called an apathetic presentation.

These symptoms can have many causes. Having a fast heartbeat, fever, or anxiety does not by itself mean that someone has thyroid storm. The concern is greatest when severe symptoms occur together, especially in a person with known or possible hyperthyroidism.

- A high temperature, often with heavy sweating
- A very fast or irregular heartbeat
- Severe restlessness, agitation, confusion, or unusual behaviour
- Nausea, vomiting, diarrhoea, or abdominal pain
- Shaking, marked weakness, or extreme tiredness
- Shortness of breath or signs of heart failure
- Yellowing of the skin or eyes from liver problems
- Seizures, severe drowsiness, or loss of consciousness in advanced cases

Causes and risk factors

Thyroid storm usually happens in someone who already has too much thyroid hormone in the body. Their hyperthyroidism may be untreated, poorly controlled, or not yet diagnosed.

Graves' disease is a common underlying cause. It is an autoimmune condition in which the immune system mistakenly stimulates the thyroid to make too much hormone. Other possible causes include toxic thyroid nodules, which are lumps that produce thyroid hormone without normal control.

A separate illness or major strain on the body often triggers the crisis. Possible triggers

include:

Not everyone with a trigger develops thyroid storm. The greatest risk is in people with severe or uncontrolled hyperthyroidism.

- A serious infection
- Surgery, major injury, or another acute illness
- Suddenly stopping antithyroid medicine
- Childbirth or severe pregnancy-related illness
- A heart attack, stroke, or blood clot in the lungs
- Diabetic ketoacidosis, a serious complication of diabetes
- Exposure to a large iodine load in someone at risk, including certain medical procedures
- Radioactive iodine treatment or thyroid surgery, although this is uncommon with appropriate preparation

Diagnosis

There is no single blood test that confirms thyroid storm. Doctors make the diagnosis from the pattern and severity of symptoms, while blood tests show whether excess thyroid hormone is present.

Thyroid blood tests usually measure thyroid-stimulating hormone, or TSH, and the thyroid hormones free T4 and T3. TSH is generally very low, while one or both thyroid hormones are raised. The hormone results alone cannot show whether someone is having a thyroid storm.

Clinical scoring systems may help assess the likelihood. These consider findings such as temperature, heart rate, digestive symptoms, heart failure, changes in awareness, and whether there is a likely trigger. Scoring systems support clinical judgement rather than replacing it.

Other tests look for organ problems and the event that triggered the crisis. These may include:

Because delays can be dangerous, treatment may begin before every result is available.

- An electrocardiogram, or ECG, to check heart rate and rhythm
- Blood tests for liver and kidney function, blood sugar, salts, and blood cells
- Blood, urine, or other samples to look for infection
- Chest imaging or other scans when needed
- Tests for the cause of hyperthyroidism after the person is stable

Treatment and management

Thyroid storm is treated in hospital, usually with continuous monitoring. Treatment aims to support the body, reduce the effects and production of thyroid hormone, and manage the trigger.

Cooling blankets, fluids, oxygen, and treatment for abnormal blood sugar or body salts may be needed. Fever is managed carefully. Aspirin is generally avoided because it can increase the amount of active thyroid hormone circulating in the blood.

A beta blocker like metoprolol or propranolol may be used to slow the heart and reduce shaking, sweating, and agitation. These medicines require careful selection and monitoring, particularly if there is heart failure, very low blood pressure, or severe breathing disease.

Antithyroid medicines, such as methimazole or propylthiouracil, reduce the thyroid's ability to make new hormone. Iodine may then be given at a carefully planned time to stop the gland from releasing stored hormone. Giving iodine after an antithyroid medicine helps prevent the thyroid from using it to make more hormone.

Corticosteroids like prednisone or hydrocortisone help reduce the conversion of T4 into the more active hormone T3. They also support the body's stress response. Other medicines may sometimes be used to reduce thyroid hormone circulating through the digestive system.

The trigger needs treatment as well. For example, antibiotics like amoxicillin or doxycycline may be given when a bacterial infection is suspected or confirmed.

If standard treatment is not working, specialist options may include procedures that remove thyroid hormone from the blood or urgent thyroid surgery. These are reserved for selected, severe situations.

After the immediate crisis has passed, treatment focuses on controlling the underlying hyperthyroidism. Longer-term options may include antithyroid medicine, radioactive iodine, or surgery. The appropriate option depends on the cause, general health, pregnancy plans, and previous treatment.

Complications

Thyroid storm places intense strain on the heart, brain, liver, and other organs. Complications can develop quickly.

Possible complications include:

Thyroid storm can be fatal, including despite treatment. Prompt recognition and emergency

care improve the chance of recovery.

- An irregular heart rhythm, especially atrial fibrillation
- Heart failure or dangerously low blood pressure
- Liver injury or liver failure
- Severe dehydration and abnormal body salts
- Blood clots, stroke, or other circulation problems
- Seizures, delirium, coma, or lasting effects from organ injury
- Failure of several organs at the same time

Prevention

Not every episode can be prevented, particularly when hyperthyroidism has not yet been diagnosed. However, maintaining control of a known overactive thyroid reduces the risk.

Take thyroid medicine as agreed and do not stop it suddenly without medical advice. If side effects or cost make treatment difficult, contact the prescribing service rather than skipping or stopping treatment.

Keep scheduled thyroid blood tests and follow-up appointments. These show whether treatment is controlling hormone levels, even when symptoms are mild.

If vomiting prevents you from keeping antithyroid medicine down, or an infection causes worsening hyperthyroid symptoms, seek prompt medical advice. People with significant hyperthyroidism may also need a specific treatment plan before surgery, radioactive iodine, or certain iodine-containing procedures.

Living with it and what to expect

The emergency phase often requires several days of close hospital care, although the course is different for each person. Heart rate, temperature, awareness, and organ function are monitored while treatment takes effect.

Recovery does not always end at hospital discharge. Weakness, poor stamina, disturbed sleep, or changes in appetite can continue while the body recovers and thyroid levels return toward the target range. Follow-up blood tests and medicine adjustments may be needed over the following weeks and months.

Thyroid storm itself can resolve, but it does not remove the underlying cause of

hyperthyroidism. Without ongoing control, another episode is possible. Some people continue antithyroid medicine, while others later have radioactive iodine treatment or surgery.

Many people return to their usual activities after recovery and effective thyroid treatment. Recovery may take longer if the crisis caused heart, liver, brain, or other organ injury. Follow-up may then involve additional specialists.

Routine follow-up should cover thyroid hormone levels, medicine effects, heart symptoms, and plans for longer-term treatment. Do not change or stop thyroid medicine based only on feeling better.

When to get medical help

Call emergency services immediately if someone with known or possible hyperthyroidism has a high fever together with a very fast heartbeat, confusion, severe agitation, fainting, seizures, breathing difficulty, repeated vomiting, or extreme drowsiness. Do not drive yourself if you may be seriously unwell.

Emergency assessment is also needed for chest pain, severe shortness of breath, collapse, or loss of consciousness, whether or not a thyroid problem is known.

Seek urgent same-day medical advice if hyperthyroid symptoms are rapidly worsening, an infection is accompanied by a racing heartbeat, or vomiting means prescribed thyroid medicine cannot be kept down.

Routine follow-up is appropriate for stable symptoms, planned thyroid blood tests, medicine reviews, and discussion of longer-term treatment after recovery. New palpitations, unexplained weight loss, heat intolerance, or persistent shaking should be assessed, but these symptoms alone do not prove thyroid storm.

Common questions

Is thyroid storm the same as hyperthyroidism?

No. Hyperthyroidism means the thyroid is producing too much hormone. Thyroid storm is an extreme, body-wide complication in which excess hormone effects cause severe illness and possible organ failure.

Can anxiety or emotional stress cause thyroid storm?

Anxiety can resemble some hyperthyroid symptoms, such as a racing heart and shaking, but it does not usually cause thyroid storm by itself. Thyroid storm generally occurs with significant

hyperthyroidism and a physical trigger such as infection, surgery, or stopping treatment.

Can thyroid storm happen if thyroid hormone levels are not extremely high?

Yes. Blood tests usually show excess thyroid hormone, but the levels may not be dramatically higher than in uncomplicated hyperthyroidism. The diagnosis depends mainly on severe symptoms and organ effects.

How long does thyroid storm last?

The most dangerous phase is treated intensively in hospital and may improve over several days. Full recovery can take weeks or longer, especially if the heart, liver, brain, or other organs were affected.

Can thyroid storm come back?

Yes. Another episode is possible if hyperthyroidism remains uncontrolled or treatment is stopped. Ongoing thyroid care and a longer-term treatment plan lower this risk.

Is thyroid storm contagious?

No. Thyroid storm cannot spread between people. An infection may trigger it, but the thyroid crisis itself is not infectious.

Sources

- Ross DS, Burch HB, Cooper DS, et al. 2016 American Thyroid Association guidelines for diagnosis and management of hyperthyroidism and other causes of thyrotoxicosis. Thyroid . 2016;26(10):1343-1421.
- Satoh T, Isozaki O, Suzuki A, et al. 2016 guidelines for the management of thyroid storm from the Japan Thyroid Association and Japan Endocrine Society. Endocrine Journal . 2016;63(12):1025-1064.
- Akamizu T, Satoh T, Isozaki O, et al. Diagnostic criteria, clinical features, and incidence of thyroid storm based on nationwide surveys. Thyroid . 2012;22(7):661-679.
- De Groot LJ, Bartalena L, Feingold KR. Thyroid storm. Endotext . National Center for Biotechnology Information.
- National Institute of Diabetes and Digestive and Kidney Diseases. Graves' disease.