CONDITION

Toxic nodular goiter

Toxic nodular goiter is an enlarged thyroid with nodules that make too much thyroid hormone.

WHAT IT IS
Overactive thyroid caused by hormone-producing nodules

BODY SYSTEM
Hormone system

MAIN SYMPTOMS
Fast heartbeat, weight loss, tremor, heat intolerance

WHAT CAUSES IT
Thyroid nodules making hormone without normal control

HOW IT IS DIAGNOSED
Thyroid blood tests and radioactive iodine uptake scan

MAIN TREATMENT
Antithyroid medicine, radioactive iodine, or surgery

CAN IT BE CURED?
Yes - definitive treatment stops hormone overproduction

IS IT AN EMERGENCY?
Sometimes - fever, rapid heartbeat, and confusion

LONG-TERM OUTLOOK
Usually good after thyroid hormone control

Overview

Toxic nodular goiter is a condition in which one or more thyroid nodules make too much thyroid hormone. A nodule is a lump within the thyroid. A goiter is an enlarged thyroid gland.

The thyroid is a small, butterfly-shaped gland at the front of your neck. Its hormones help control heart rate, body temperature, digestion, muscle function, and how quickly your body uses energy.

In this condition, the nodules become partly or fully independent of the body's normal hormone controls. This can cause hyperthyroidism, meaning an overactive thyroid. "Toxic" refers to excess thyroid hormone. It does not mean that the nodules contain poison.

When several nodules are involved, the condition is often called toxic multinodular goiter. A

single overactive nodule may be called a toxic adenoma. These conditions are managed in similar ways, although nodule size, number, and scan results can affect treatment choices.

Some people have clear symptoms. Others have only mild blood test changes, called subclinical hyperthyroidism. Even mild, long-lasting overactivity can matter because it may affect the heart and bones.

Symptoms

Symptoms develop because excess thyroid hormone speeds up many body processes. They may appear gradually and can be less obvious in older adults.

Possible symptoms include:

A large goiter can press on nearby structures. This may cause a tight feeling in the neck, trouble swallowing, a hoarse voice, or difficulty breathing when lying down.

Older adults may not have the typical combination of tremor, sweating, and weight loss. Their main signs may be an irregular heart rhythm, weakness, reduced appetite, or worsening heart problems.

Unlike Graves' disease, toxic nodular goiter does not usually cause thyroid-related eye disease.

- A fast, pounding, or irregular heartbeat
- Shaking hands, nervousness, or difficulty sleeping
- Feeling unusually warm or sweating more
- Weight loss despite a normal or increased appetite
- Frequent bowel movements
- Muscle weakness or tiredness
- Shortness of breath with activity
- Menstrual changes
- Swelling or lumps at the front of the neck

Causes and risk factors

Toxic nodular goiter usually develops from thyroid nodules that have been present for years. Over time, some cells within a nodule may begin making thyroid hormone without waiting for the usual signal from the brain.

These changes are generally acquired rather than inherited. Alterations in the nodule's cells can keep the hormone-making pathway switched on. The nodules are usually benign, meaning noncancerous.

The condition becomes more common with increasing age. It may be more likely in people who have had a longstanding goiter or who grew up in an area where iodine deficiency was common.

A large iodine exposure can sometimes reveal or worsen thyroid overactivity in someone with autonomous nodules. Possible sources include iodinated contrast used for some scans, certain medicines such as amiodarone, and high-dose iodine supplements. Normal food intake is not usually the cause.

Having a risk factor does not mean that you will develop toxic nodular goiter. Many people with thyroid nodules never develop excess hormone production.

Diagnosis

Diagnosis begins with blood tests. Thyroid-stimulating hormone, or TSH, is usually low because the brain is trying to tell the thyroid to make less hormone. Free thyroxine, called free T4, and triiodothyronine, called T3, may be high.

If TSH is low but T4 and T3 remain within the laboratory range, this is called subclinical hyperthyroidism. Follow-up testing may be needed because illness, pregnancy, supplements, and some medicines can affect thyroid results.

A radioactive iodine uptake scan can show whether a nodule is making excess hormone. You swallow or receive a small amount of radioactive tracer. A scanner then measures where the thyroid absorbs it. Overactive, or "hot," nodules take up more tracer than the surrounding thyroid tissue.

Radioactive iodine scans are generally not used during pregnancy. Breastfeeding also affects whether and when these tests can be performed. Tell the healthcare team if you could be pregnant or are breastfeeding.

An ultrasound uses sound waves to show the thyroid's size and the features of each nodule. It cannot determine hormone production, so it does not replace an uptake scan when the cause of hyperthyroidism is unclear.

Most hot nodules are benign. A needle biopsy is not automatically needed for every overactive nodule. It may be recommended if an ultrasound finds a separate nodule or features that need further assessment.

Treatment and management

Treatment aims to control excess thyroid hormone, ease symptoms, and reduce the risk of heart and bone complications. The best approach is influenced by your hormone levels, age, other health conditions, goiter size, scan findings, and preferences.

Beta blockers like metoprolol or propranolol may be used for short-term symptom relief. They can slow a fast heart rate and reduce shaking, but they do not stop the nodules from making thyroid hormone.

Antithyroid medicines reduce hormone production. They can bring thyroid levels under control before radioactive iodine or surgery, or they may be used longer term when definitive treatment is not suitable or wanted. Unlike Graves' disease, toxic nodules rarely enter lasting remission when antithyroid medicine is stopped.

Rarely, antithyroid medicines can cause a serious fall in infection-fighting white blood cells or liver injury. If you take one, follow the medicine-specific safety instructions. Fever or a severe sore throat requires prompt medical advice and usually an urgent blood test. Yellow skin, dark urine, or marked itching also needs prompt assessment.

Radioactive iodine treatment is swallowed as a capsule or liquid. The overactive thyroid tissue absorbs the iodine and is gradually damaged. Hormone levels usually change over weeks to months, and the goiter may shrink. More than one treatment is sometimes needed. Radioactive iodine is not used during pregnancy or breastfeeding, and temporary radiation-safety precautions are required afterward.

Surgery removes part or all of the thyroid. It may be considered for a large goiter, pressure symptoms, concerning nodules, or when other options are unsuitable. Surgery works quickly but carries risks such as bleeding, voice changes from nerve injury, and low calcium if nearby parathyroid glands are affected. An experienced thyroid surgeon can discuss these risks.

After radioactive iodine or surgery, the thyroid may become underactive. This is treated with daily thyroid hormone replacement and monitored with blood tests.

Some people with mild subclinical hyperthyroidism are monitored rather than treated immediately. Follow-up matters because hormone levels can change, and the decision to treat also considers heart rhythm and bone health.

Complications

Untreated or poorly controlled thyroid overactivity puts extra strain on the heart. It can cause atrial fibrillation, an irregular rhythm that may increase the risk of blood clots and stroke. It can

also worsen chest pain or heart failure in someone with underlying heart disease.

Long-term hyperthyroidism can speed up bone loss. This may contribute to osteoporosis, in which bones become weaker and break more easily.

A growing goiter may gradually press on the windpipe or swallowing tube. Sudden bleeding into a nodule is uncommon but can cause rapid swelling and pain.

Thyroid storm is a rare, life-threatening worsening of hyperthyroidism. It causes severe symptoms such as high fever, a very fast heartbeat, confusion, agitation, vomiting, or collapse. It needs emergency hospital treatment.

Prevention

Most cases cannot be reliably prevented. Thyroid nodules usually develop through a combination of age-related changes and factors that are not under your control.

Do not take high-dose iodine, kelp, or "thyroid support" supplements unless a qualified healthcare professional has recommended them. These products may contain enough iodine or thyroid hormone to worsen an overactive thyroid.

Tell the healthcare team about your thyroid condition before receiving iodinated contrast or starting a medicine that contains iodine. This does not mean necessary scans or medicines must always be avoided. It allows the risks and monitoring plan to be considered.

Eating a balanced diet with an appropriate amount of iodine supports normal thyroid function, but changing your diet cannot switch off an autonomous nodule.

Living with it and what to expect

Toxic nodular goiter often develops slowly. Without definitive treatment, the nodules usually continue to make hormone. They do not commonly return to normal control on their own.

Antithyroid medicine can keep hormone levels within range while you take it, but regular blood tests are needed. If you have radioactive iodine, hormone levels may take several months to settle. Surgery usually corrects the overactivity quickly, although recovery and follow-up still take time.

After treatment, you may need lifelong thyroid hormone replacement if the remaining thyroid cannot make enough. The dose is checked with blood tests and may need adjustment over time.

Symptoms such as tremor, sweating, and a rapid heartbeat often improve as hormone levels

return toward normal. Weight may increase if excess thyroid hormone had caused weight loss. The aim is to restore a healthy metabolic rate, not to cause unwanted weight gain.

The nodules or goiter may remain visible after medical treatment, even when hormone levels are controlled. Radioactive iodine often reduces their size gradually, while surgery removes the treated thyroid tissue directly.

Most people can work, exercise, travel, and follow their usual routines once thyroid levels are stable. Ongoing follow-up may include thyroid blood tests, neck examinations, and ultrasound monitoring of nodules that remain.

When to get medical help

Arrange a routine medical appointment if you develop a persistent fast or irregular heartbeat, unexplained weight loss, shaking, heat intolerance, neck swelling, or symptoms that could suggest an overactive thyroid.

Seek prompt medical advice if:

Call emergency services for severe difficulty breathing, chest pain, fainting, or signs of thyroid storm such as high fever, a very fast heartbeat, confusion, severe agitation, repeated vomiting, or collapse.

- A neck lump grows quickly or causes new hoarseness
- You have trouble swallowing or shortness of breath when lying down
- Your heartbeat becomes persistently fast or irregular
- You develop fever or a severe sore throat while taking antithyroid medicine
- You develop yellow skin, dark urine, or marked itching during treatment

Common questions

Is toxic nodular goiter cancer?

Usually not. Most hormone-producing thyroid nodules are benign. However, a thyroid can contain more than one type of nodule. Ultrasound and, when appropriate, a needle biopsy help assess any area that looks separate or concerning.

Can toxic nodular goiter go away on its own?

It rarely resolves on its own. Overactive nodules generally continue making hormone because they no longer respond normally to the body's control signals. Medicines can control

production, while radioactive iodine or surgery can provide definitive treatment.

Will I gain weight after treatment?

You may regain weight that was lost because of hyperthyroidism. Some people gain more than expected as their appetite and metabolism readjust. Regular thyroid testing helps identify an underactive thyroid, which can also contribute to weight gain.

What foods should I avoid?

Most people do not need a special diet. Avoid high-dose iodine, kelp, and unregulated thyroid supplements unless specifically advised otherwise. Tell the healthcare team about all supplements because biotin and other products can interfere with thyroid blood tests.

Can I become pregnant with toxic nodular goiter?

Pregnancy is possible, but uncontrolled hyperthyroidism can affect pregnancy and requires specialist care. Radioactive iodine must not be used during pregnancy. If you are planning a pregnancy, discuss treatment timing and medication safety in advance.

Does radioactive iodine make me radioactive?

For a short time, your body gives off a small amount of radiation from the treatment. You will receive instructions about distance from other people, sleeping arrangements, hygiene, and contact with children or pregnant people. The exact precautions depend on the treatment and local rules.

Sources

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