Hyperthyroidism (overactive thyroid gland)

What is the thyroid?
The normal thyroid is a butterfly-shaped gland that lies at the base of the neck, in front of the windpipe. It produces hormones that are important for the body's metabolism and organ function. Thyroid hormone influences conditions such as heart rate, cholesterol level, muscle strength, skin condition, menstrual cycle and mental state. In children, thyroid hormone is essential for normal growth and development. Therefore all newborn babies are now screened for thyroid abnormalities with the heel prick blood test.

How does the thyroid gland function?
The thyroid gland is usually controlled by a hormone released by the pituitary gland (a gland in the brain about 5 cm behind the top of your nose) called TSH (thyroid stimulating hormone). The thyroid responds to TSH by releasing thyroid hormones (known as T4 and T3) which then enter the bloodstream and affect the metabolism of the body. As part of a feedback mechanism the pituitary gland monitors the level of thyroid hormone in the blood and increases or decreases the amount of TSH released, which then changes the amount of thyroid hormone in the blood.

Hyperthyroidism
Hyperthyroidism (or thyrotoxicosis) occurs when the thyroid gland becomes overactive and produces too much thyroid hormone. It is less common than an underactive thyroid gland and is six to 10 times more frequent in women than men. It can occur at any age but particularly affects women in their 20s and 40s.

What are the symptoms and signs of hyperthyroidism?
The spectrum of possible signs and symptoms resulting from hyperthyroidism include heat intolerance, tremor, excessive sweating, anxiety, irritability, palpitations (rapid heartbeat), weight loss (despite a good appetite) and general fatigue or weakness. Occasionally itch, difficulty sleeping, diarrhoea, excessive drinking and, in females, light menstrual periods are seen. The severity of symptoms depends on the duration of disease as well as the amount of thyroid hormone excess. In the elderly the symptoms may be less obvious and include general debility, a heart rhythm called atrial fibrillation or heart failure. In children rapid growth and emotional problems may be seen. Symptoms of thyroid eye disease include gritty eyes, excessive tears, puffiness around the eyes, poppy eyes, and rarely, double vision.
What causes hyperthyroidism?

The most common form of hyperthyroidism is Graves' disease. In Graves' disease, the hyperthyroidism is caused by antibodies which stimulate the thyroid gland to produce excessive thyroid hormone. Why certain individuals develop Graves' disease remains unknown but depends partly on genetic factors. Hyperthyroidism may be associated with changes in the eyes, which result in the eyes appearing to stare. In Graves' disease a characteristic involvement of the eyes, called thyroid eye disease (or Graves' ophthalmopathy) may be seen. These eye signs can be diagnosed by a doctor examining the person's eyes and are present in about 50% of people with Graves' disease. They are caused by inflammation of the muscles and fat behind the eye and may result in the eyes protruding. Rarely an itchy skin rash (called pretibial myxoedema) may be seen on the lower legs.

Other causes of hyperthyroidism include small lumps (called nodules) of thyroid tissue that produce too much thyroid hormone. A toxic multinodular goitre, when there are several nodules, is more common in older people. A single overactive lump is called a toxic nodule. Sometimes inflammation of the thyroid (thyroiditis) causes hyperthyroidism, particularly after childbirth and occasionally with a viral infection. Rarely hyperthyroidism is due to medication such as amiodarone or lithium, or substances with lots of iodine – kelp or seaweed tablets.

How is an overactive thyroid diagnosed?

In hyperthyroidism the level of TSH in the blood is below normal (suppressed) and the level of T4 (free T4) or T3 (free T3) is raised. The specific cause of the hyperthyroidism must also be determined as this influences the choice of treatment. In Graves' disease there is usually enlargement of the thyroid gland (a goitre), there may be eye signs and antibodies to the thyroid are usually detected on a blood sample. A special thyroid scan using a radiolabelled substance helps your doctor diagnose the cause of the hyperthyroidism.

What is the treatment for hyperthyroidism?

Treatment of an overactive thyroid gland depends on the cause and patient preference. It may be complex and require a long-term care plan. Once the diagnosis is confirmed, treatment is directed at reducing the amount of thyroid hormone produced by the gland. Treatment options for hyperthyroidism include medication, radioiodine therapy and thyroid surgery.

Medication

The antithyroid drugs (carbimazole and propylthiouracil) block thyroid hormone production. It takes about 10 days after starting these tablets before the levels of thyroid hormone in the blood start to fall. Usually the levels are back to normal after four to six weeks of treatment. The starting dose of carbimazole (tradename Neo-Mercazole) may be two to four tablets taken morning and night initially and then the dose is often reduced to one or two tablets daily.
Propylthiouracil may be preferable during early pregnancy. If someone has severe symptoms of tremor or palpitations, a drug called a beta blocker (such as propranolol or metoprolol) may be used to help control these symptoms for the first few weeks. In patients with Graves' disease, a 12-month course of antithyroid drugs is often recommended. Occasionally six months of high-dose antithyroid drugs together with thyroxine therapy is used (called block and replace). While a person is taking antithyroid drugs periodic monitoring of thyroid hormone levels is necessary. After a course of antithyroid drugs about 50% of people with Graves' disease will remain well with no further thyroid problems. However 50% will become hyperthyroid again (called a relapse). Most relapses occur during the first one to two years after ceasing medication but they may occur many years later.

**What are the side effects of antithyroid drugs?**

Side effects of carbimazole or propylthiouracil affect less than 5% of people and include stomach upset, skin rash and joint pains. A rare but serious side effect, occurring in about one of every 300 people, is a low white blood cell count. Because of this rare side effect, any person taking carbimazole or propylthiouracil who gets a sore throat, mouth ulcers, or high fever should stop their tablets immediately, see their GP, and have their white blood cell count checked. Propylthiouracil can occasionally cause liver problems and is used only rarely.

**Radioiodine therapy**

Destroying the thyroid with a form of iodine that is radioactive is a more permanent way to treat hyperthyroidism. The amount of radiation is small and does not cause cancer. In America it is the most widely used treatment for hyperthyroidism. It is often given when hyperthyroidism returns after a course of antithyroid drugs or when thyroid nodule(s) cause the hyperthyroidism. Occasionally thyroid eye disease may worsen after radioiodine. Radioiodine is given as an outpatient drink which is tasteless or as capsules. In approximately 80% of people, the radioiodine cures the hyperthyroidism; 10% of people require a second dose. After radioiodine therapy we recommend no contact with children under 10 years or pregnant women for the first few days, then limited contact for two to three weeks to avoid exposing them to low doses of radiation. Following radioiodine there is a risk that your thyroid gland will become underactive (hypothyroid) of 50% at 10 years. This is easily treated with thyroid hormone tablets but it does mean all people who have radioiodine treatment need a yearly blood test for the rest of their lives, checking for an underactive thyroid.
Thyroid surgery
Surgery to remove part or all of the thyroid gland is another type of treatment and may be preferred for very large thyroid glands. This must be performed by an experienced surgeon. Thyroid surgery usually involves a few days in hospital and results in a scar at the base of the neck. Complications of the surgery are rare (less than 3%) but include possible damage to the body's calcium balance, vocal cords and usually result in the thyroid gland becoming underactive (hypothyroid) which is easily treated with thyroid hormone replacement therapy.

Which type of treatment is the best?
There is no best type of treatment. It depends on your age, the cause of the hyperthyroidism, the presence of other medical problems and, above all, the preference of the individual patient. Most younger patients with Graves' disease opt to try an initial course of antithyroid drugs with a 50% chance of long-term remission, but if control of thyroid hormone levels is difficult or their disease relapses, radioiodine or surgery may be recommended. For patients with a toxic nodular goitre and for older patients where other diseases, including heart disease, are more frequent and may be worsened by an overactive thyroid, radioiodine or occasionally surgery may be best.

How will I know if my thyroid hormone levels become too low?
If you develop an underactive thyroid gland (hypothyroidism) from too much carbimazole or after radioiodine or surgery, you may have symptoms of difficulty tolerating the cold, lethargy, weight gain dry skin or hair, or constipation. A simple blood test can check your thyroid function.

What will happen if my overactive thyroid gland is not treated?
An excess amount of thyroid hormone in the body over a long period of time may result in thin bones (osteoporosis) and heart disease.

Pregnancy
As long as your hyperthyroidism is controlled, your chances of getting pregnant are normal. For the success of your pregnancy and your baby's wellbeing, it is important to control your hyperthyroidism. However, the medicines that do this can affect your baby’s thyroid function. If you plan to get pregnant, talk to your doctor. The best time to conceive is when your hyperthyroidism has been treated, you have stopped taking medication, and you don’t have any symptoms.
If you get pregnant while still needing medication, your doctor will arrange for you to see a specialist. The specialist will work out a medication dose that will control your hyperthyroidism while minimising any risk to your baby.
If you have Graves' disease, there is a slight risk (less than 2%) that your baby will have high thyroid hormone levels. The risk is still present even if you have had your Graves' disease treated with thyroid surgery or radioiodine. In this case, you will be referred to the Obstetric Medicine clinic and the specialist may recommend a blood test and monitoring during pregnancy.

Fortunately, an over-active thyroid due to Graves’ disease often settles down during pregnancy. This means you can take less medication, and perhaps stop it altogether, as your pregnancy goes on.

Pregnant women should never have radioiodine. If you have had radioiodine therapy, avoid getting pregnant for six months after the treatment.

**Can people with hyperthyroidism live a normal life?**

Provided people with hyperthyroidism are properly treated, they can lead a normal active life with no specific physical or occupational restrictions.

**More information**

If you wish to obtain more information, recommended web pages providing a reliable source of information include:

- [National Institutes of Health](www.nlm.nih.gov/medlineplus)
- [The American Thyroid Association](www.thyroid.org)
- [The Endocrine Society](www.endo-society.org)
- [Patient.co.uk](www.patient.co.uk/health/hyperthyroidism-overactive-thyroid)

**See also:**

- [Goitre](healthinfo.org.nz/81887.htm)
- [Radioiodine treatment for thyrotoxicosis (overactive thyroid)](healthinfo.org.nz/70799.htm)

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