



## Thyroid Disease

Thyroid disease occurs when the thyroid (a small, butterfly-shaped gland in the front of your neck) does not produce the right amount of thyroid hormone. These hormones control how your body uses energy. If you are feeling fatigued, notice skin or hair changes, or have hoarseness or pain, your doctor may conduct a physical exam and order blood tests. If these tests indicate a problem, your doctor may order thyroid scan and uptake, thyroid biopsy, or imaging tests to help diagnose and evaluate a thyroid condition. Treatment will depend on the specific nature of your thyroid condition and its underlying cause.



### What is thyroid disease?

The thyroid is a small, butterfly-shaped gland in the front of your neck that wraps around your windpipe (trachea). The two halves of the thyroid gland are connected in the middle by a thin layer of tissue known as the isthmus. The thyroid gland uses iodine (mostly absorbed from food) to produce hormones that control how your body uses energy. Nearly every organ in the body is affected by the function of the thyroid gland.

The pituitary gland and hypothalamus, an area at the base of the brain, control the rate at which the thyroid produces and releases these hormones. The main function of the thyroid gland is to release a hormone called thyroxine or T4, which is converted into a hormone called T3. Both of these hormones circulate in the bloodstream and help regulate your metabolism. The amount of T4 produced by the thyroid gland is determined by a hormone produced by the pituitary gland called TSH or thyroid-stimulating hormone. Depending on T4 levels in the body, the pituitary gland produces either more or less TSH in order to prompt the thyroid to produce the appropriate amount of T4.

Thyroid disease occurs when the thyroid fails to function properly, either by releasing too much T4 hormone or by not releasing enough. There are three main thyroid disorders:

- Hypothyroidism (underactive thyroid)

- Hyperthyroidism (overactive thyroid)
- Thyroid cancer.

## **Hypothyroidism (underactive thyroid)**

Hypothyroidism occurs when the thyroid gland does not produce enough T4 hormone. Underactive thyroid may occur because the pituitary gland, the hypothalamus or the thyroid itself is not working properly. Nearly five percent of the population has an underactive thyroid; more women than men suffer from the condition. Symptoms of an underactive thyroid include:

- high cholesterol
- depression
- fatigue
- hair loss
- memory loss
- extremely dry skin
- feeling cold
- constipation.

## **Hyperthyroidism (overactive thyroid)**

Hyperthyroidism occurs when the thyroid gland produces more thyroid hormone than the body needs. Overactive thyroid may occur because the hypothalamus, the pituitary gland, or the thyroid itself is not working properly. Overactive thyroid is not very common. It only affects a little over one percent of the U.S. population. Just like underactive thyroid, more women than men suffer from the condition.

Symptoms of an overactive thyroid include:

- restlessness
- agitation
- tremors
- weight loss
- rapid heart rate
- sweating
- intolerance to heat
- irregular menstrual flow
- thinning skin

- sleep changes
- frequent bowel movements
- goiter, an enlargement of the thyroid gland that resembles a large mass protruding from the neck and is caused by the excess hormone production in the gland.

Older patients may experience arrhythmias (irregular heart rhythms), heart failure and mental confusion (delirium). If left untreated, patients can suffer from a "thyroid storm" in which high blood pressure, heart failure and fever can lead to a critical situation requiring urgent medical care.

## Thyroid Cancer

Thyroid cancer occurs when cells in the thyroid change and multiply, and cancerous cells form nodules or growths. If left untreated, these cancerous nodules can spread into the lymph nodes, surrounding tissues, and bloodstream. Thyroid cancer is uncommon. However, rates have been on the rise over the last 30 years. Experts believe this increase is mostly due to better detection through the use of ultrasound technology. Most thyroid cancers can be cured. There are four different kinds of thyroid cancer.

- **Papillary thyroid cancer:** 70 percent of patients diagnosed with thyroid cancer have papillary thyroid cancer. This cancer starts in the follicular cells where thyroid hormone is stored. It is slow growing, but up to 20 percent of patients may have cancer spread to the lymph nodes of the neck at the time of diagnosis.
- **Follicular thyroid cancer:** Like papillary thyroid cancer, follicular thyroid cancer also starts in the follicular cells. However, it is much more aggressive than papillary cancer and often spreads into the bloodstream and to the lungs or bones. Most patients with follicular thyroid cancer are over the age of 40. A rare type of follicular thyroid cancer is called Hurthle cell cancer. Hurthle cell cancers are more likely to have metastasized (spread) at the time of diagnosis than the other types of differentiated thyroid cancer.
- **Medullary thyroid cancer:** Medullary thyroid cancer is rare. Only four percent of patients diagnosed with thyroid cancer have this type of cancer. It develops in the C cells of the thyroid that make a hormone called calcitonin. Calcitonin helps the body maintain the appropriate level of calcium. Medullary thyroid cancer may be associated with other types of cancer and may also be genetic. This cancer has a lower cure rate than papillary or follicular thyroid cancers. However, the overall 10-year survival rates are as high as 90 percent when the disease is confined to the thyroid gland.
- **Anaplastic thyroid cancer:** Anaplastic thyroid cancer is the rarest form of thyroid cancer. It affects only one percent of patients diagnosed with thyroid cancer. It is the most aggressive and most difficult thyroid cancer to treat. Anaplastic cancer is often called "undifferentiated" because the cells do not look or act like typical thyroid cells. It can occur within follicular or papillary thyroid cancer or within a goiter. Most patients diagnosed with anaplastic thyroid cancer are over the age of 60. The majority of patients with anaplastic thyroid cancer will have metastases (secondary tumors) present at the time of diagnosis.

There are many causes of thyroid disorders. Conditions that affect how the thyroid functions include:

- **Thyroiditis (inflamed thyroid):** The thyroid gland can become inflamed for unknown reasons. This inflammation causes extra thyroid hormone to leak into the bloodstream, causing too much thyroid hormone to circulate throughout the body, or hyperthyroidism (overactive thyroid). This period of hyperthyroidism typically lasts no more than three months. Eventually, the thyroid becomes underactive, releasing too little T4 hormone either temporarily or permanently. A viral or bacterial infection may be the cause of some thyroiditis. The condition may also occur following childbirth. Most of the time, the inflammation is painless. However, for patients with a condition called subacute granulomatous thyroiditis, pain or soreness around the thyroid can last for several weeks.
- **Hashimoto's disease or chronic lymphocytic thyroiditis (inflamed thyroid):** This condition occurs when a patient's own immune system identifies the thyroid as foreign and produces antibodies to attack it. The thyroid becomes chronically inflamed from these attacks and stops producing enough thyroid hormone for the body to function properly. Scientists believe possible causes of Hashimoto's disease include a virus or a bacterium that triggers the overactive immune response and a genetic predisposition to the disorder. People who suffer from other autoimmune disorders such as arthritis, lupus and Type 1 diabetes are at higher risk of developing the disease, as are people who have been exposed to higher levels of environmental radiation.
- **Pituitary or hypothalamic disease:** Because the thyroid is regulated by the pituitary gland and the hypothalamus, injury to or dysfunction in these areas may cause the thyroid to become underactive, causing a condition known as secondary hypothyroidism or tertiary hypothyroidism.
- **Radiation treatment:** Patients who have received radioactive iodine for an overactive thyroid typically experience hypothyroidism (underactive thyroid) after the treatment. Patients who receive external beam radiation therapy (EBT) to the thyroid, neck or chest for cancer treatment may also experience thyroid dysfunction.
- **Graves' Disease:** The most common cause of overactive thyroid is Graves' Disease. It occurs when the immune system creates antibodies that cause the thyroid to grow and make more T4 thyroid hormone than the body needs. In healthy people, the amount of T4 is regulated by TSH (thyroid-stimulating hormone). Patients with Graves' disease release antibodies that mimic TSH and fool the thyroid into producing more T4 than is necessary, leading to overactive thyroid. The antibodies that attack the thyroid often also attack the tissue behind the eyes, a condition known as Graves' ophthalmopathy or thyroid eye disease. This condition may cause mild symptoms such as red and irritated eyes or sensitivity to light. It may also cause one or both eyes to protrude from the eye sockets as a result of inflammation and swelling in the muscles and tissues in the eye socket. Patients with Graves' Disease can uncommonly also develop skin thickening and redness on the front of their lower legs, a condition called Graves' dermopathy.
- **Hyperfunctioning thyroid nodules** (also called toxic adenoma, toxic multinodular goiter or Plummer's disease): Non-cancerous nodules called adenomas occur when part of the thyroid gland begins to swell and separate from the rest of the gland. These adenomas may begin producing thyroid hormones independently of the rest of the thyroid gland, a condition called a functioning nodule. When these nodules do not respond to the normal feedback mechanisms meant to keep the thyroid hormone levels in check, this is known as a toxic adenoma or Plummer's disease.

## How is thyroid disease diagnosed and evaluated?

Symptoms often prompt patients to visit the doctor, including fatigue, the inability to get pregnant, changes in the skin or hair, a lump in the neck, hoarseness or pain in the thyroid area. Based on these symptoms, a doctor will likely perform a physical exam to determine whether the thyroid is enlarged and order blood tests to measure thyroid hormone levels. If blood tests reveal signs of abnormal thyroid activity or thyroid cancer, further testing will be required, such as:

- **Thyroid Scan and Uptake:** During this test, a small amount of radioactive iodine (radioiodine) is swallowed. Over a period of time, the iodine collects in the thyroid. After a few hours, you will be placed in front of a special camera called a gamma camera to measure the amount of iodine absorbed by your thyroid. This device does not emit radiation, but there is a small amount of radiation exposure from the swallowed or injected radioiodine. See the Thyroid Scan and Uptake page for more information.
- **Ultrasound-guided fine-needle aspiration biopsy:** During a fine needle aspiration biopsy of the thyroid, a thin, hollow needle is inserted through the skin (using ultrasound imaging for guidance) and into the thyroid gland or the suspicious nodule. A small sample of tissue is removed for examination under a microscope to determine if cancer is present. See the Thyroid Biopsy page for more information.
- **Imaging tests (CT scan, PET/CT scan, whole body iodine scan):** If it is determined that you have thyroid cancer, your doctor will order one or more imaging studies to determine the size and location of the thyroid cancer and if it has spread. See the Body CT Scan, the PET/CT Scan and the Thyroid scan and uptake pages for more information.

## How is thyroid disease treated?

**Hypothyroidism (underactive thyroid):** Patients suffering from underactive thyroid are generally given a synthetic (man-made) thyroid hormone known as levothyroxine (Synthroid®). Levothyroxine will restore your body's hormone levels and provide symptom relief. Your blood will be tested periodically to make sure the medication is controlling your hypothyroidism. It may take several months to determine the right dosage needed to control your symptoms. Patients with underactive thyroid generally need to take replacement thyroid hormone for the rest of their lives.

**Hyperthyroidism (overactive thyroid):** The treatment for patients with overactive thyroid depends on how severe the symptoms are and what the underlying cause is. You and your doctor will discuss which of the following options is best for you.

- **Anti-thyroid medications:** Medication such as methimazole (Tapazole®) prevents the thyroid from producing too much thyroid hormone. It is often used for patients suffering from Graves' disease or before thyroid surgery. Symptom relief typically occurs within six to 12 weeks of starting the medication but therapy usually continues for at least a year. Twenty to 30 percent of patients have permanent relief while others may see the symptoms return. Anti-thyroid medications

may affect your liver and increase your risk of infections. A small number of people are allergic to these medications.

- **Radioactive iodine:** Radioactive iodine (I-131), an isotope of iodine that emits radiation, is commonly used to treat hyperthyroidism. When a small dose of I-131 is swallowed, it is absorbed into the bloodstream and absorbed by the thyroid gland, where it begins destroying the gland's cells. Over a period of three to six months, patients generally see their symptoms subside. Radioactive iodine typically causes the thyroid to become underactive, and many patients will require daily synthetic thyroid hormone to restore adequate hormone levels in the body. Radioactive iodine has been used for decades and has been shown to be safe. See the Radioactive Iodine page for more information.
- **Beta blockers:** This is a class of drug used to treat high blood pressure. Beta blockers do not treat the thyroid directly but can help reduce a rapid heart rate and prevent heart palpitations. Beta blockers are often given along with anti-thyroid medication and radioactive iodine to help patients feel better until the thyroid is functioning more normally. Beta blockers are generally well tolerated but patients may experience upset stomach, diarrhea, dizziness or headache.
- **Surgery (thyroidectomy):** For patients who are not able to either take anti-thyroid medication or radioactive iodine, surgical removal of the thyroid, called a thyroidectomy, is an option. For this procedure, the surgeon makes an incision at the base of the neck and removes most of the thyroid gland. In a minimally invasive video-assisted thyroidectomy, a smaller incision is made and the surgeon is aided by a video camera. Most surgeries last between 2 and 2 ½ hours. Patients either return home the same day or the next day after a period of observation. While thyroid surgery complications are rare, there is always risk involved with surgery. An experienced surgeon can help avoid complications such as damage to the parathyroid glands (causing low calcium levels) or to the vocal cords (causing hoarseness in the voice). Once the thyroid gland is removed, patients need lifelong replacement of thyroid hormones with synthetic hormones (Synthroid®). If the parathyroid glands are also removed, patients will need calcium supplements as well.

**Thyroid Cancer:** Most thyroid cancers are treated with surgery to remove the thyroid gland. Radioactive iodine therapy is often used after surgery to destroy any remaining thyroid tissue. This includes both healthy remaining tissue and any remaining cancer cells. Depending on the stage of the cancer, lymph nodes in the neck may also be removed for testing. In some cases where the cancer is very small, only a portion of the gland may be removed. The partial removal of the gland is called a thyroid lobectomy. After surgery, most patients will need to take daily synthetic thyroid hormone for the rest of their lives. You and your doctor will discuss the best surgical option for you depending on the kind of cancer you have and whether or not it has spread. See the Radioactive Iodine page for more information.

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