About Thyroid Cancer

Overview and Types

If you have been diagnosed with thyroid cancer or are worried about it, you likely have a lot of questions. Learning some basics is a good place to start.

- What Is Thyroid Cancer?

Research and Statistics

See the latest estimates for new cases of thyroid cancer and deaths in the US and what research is currently being done.

- Key Statistics for Thyroid Cancer
- What's New in Thyroid Cancer Research?

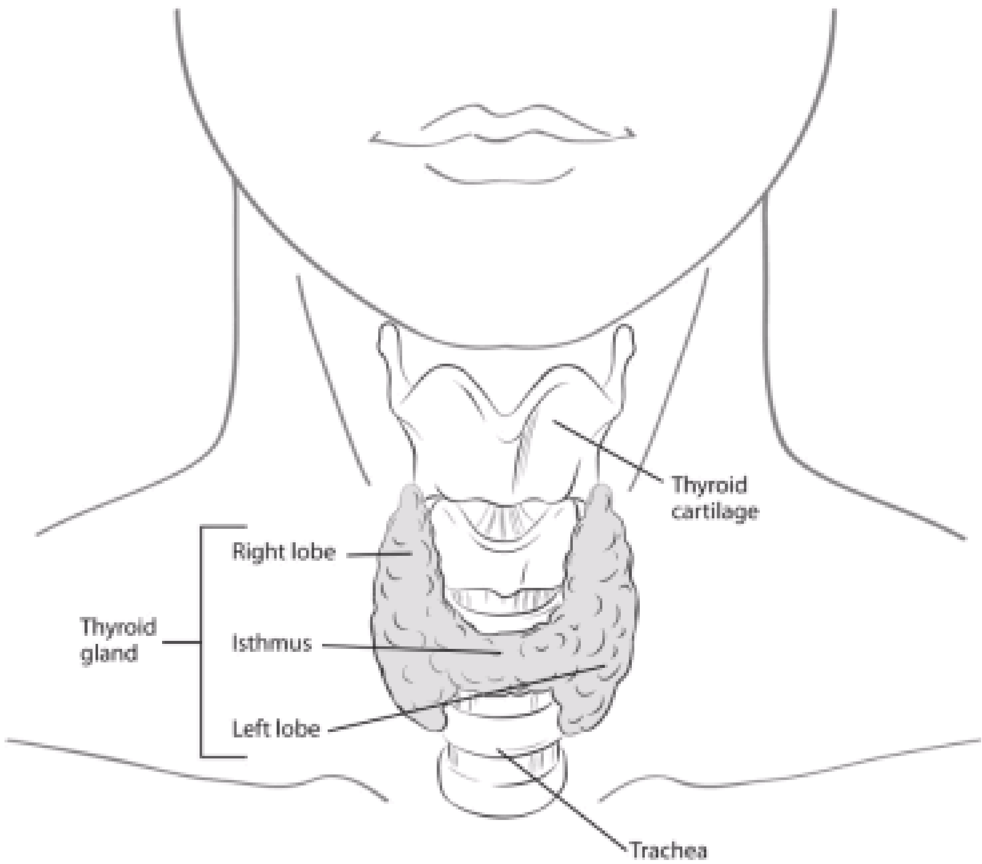
What Is Thyroid Cancer?

Thyroid cancer is a type of cancer that starts in the thyroid gland. Cancer starts when cells begin to grow out of control. (To learn more about how cancers start and spread, see What Is Cancer?[1])

The thyroid gland makes hormones that help regulate your metabolism, heart rate, blood pressure, and body temperature.

Where thyroid cancer starts

The thyroid gland is in the front part of the neck, below the thyroid cartilage (Adam's apple). In most people, the thyroid cannot be seen or felt. It is shaped like a butterfly, with 2 lobes — the right lobe and the left lobe — joined by a narrow piece of gland called the isthmus(see picture below).



The thyroid gland has 2 main types of cells:

- **Follicular cells** use iodine from the blood to make thyroid hormones, which help regulate a person's metabolism. Having too much thyroid hormone (*hyperthyroidism*) can cause a fast or irregular heartbeat, trouble sleeping, nervousness, hunger, weight loss, and a feeling of being too warm. Having too little hormone (*hypothyroidism*) causes a person to slow down, feel tired, and gain weight. The amount of thyroid hormone released by the thyroid is regulated by the pituitary gland at the base of the brain, which makes a substance called *thyroid-stimulating hormone* (TSH).

- **C cells** (also called *parafollicular cells*) make calcitonin, a hormone that helps control how the body uses calcium.

Other, less common cells in the thyroid gland include immune system cells (lymphocytes) and supportive (stromal) cells.

Different cancers develop from each kind of cell. The differences are important because they affect how serious the cancer is and what type of treatment is needed.

Many types of growths and tumors can develop in the thyroid gland. Most of these are benign (non-cancerous) but others are malignant (cancerous), which means they can spread into nearby tissues and to other parts of the body.

Benign thyroid conditions

Thyroid enlargement

Changes in the thyroid gland’s size and shape can often be felt or even seen by patients or by their doctor.

An abnormally large thyroid gland is sometimes called a *goiter*. Some goiters are *diffuse*, meaning that the whole gland is large. Other goiters are *nodular*, meaning that the gland is large and has one or more nodules (bumps) in it. There are many reasons the thyroid gland might be larger than usual, and most of the time it is not cancer. Both diffuse and nodular goiters are usually caused by an imbalance in certain hormones. For example, not getting enough iodine in the diet can cause changes in hormone levels and lead to a goiter.

Thyroid nodules

Lumps or bumps in the thyroid gland are called *thyroid nodules*. Most thyroid nodules are benign, but about 2 or 3 in 20 are cancerous. Sometimes these nodules make too much thyroid hormone and cause hyperthyroidism. Nodules that produce too much thyroid hormone are almost always benign.

People can develop thyroid nodules at any age, but they occur most commonly in older adults. Fewer than 1 in 10 adults have thyroid nodules that can be felt by a doctor. But when the thyroid is looked at with an ultrasound, many more people are found to have nodules that are too small to feel and most of them are benign.

Most nodules are cysts filled with fluid or with a stored form of thyroid hormone called *colloid*. Solid nodules have little fluid or colloid and are more likely to be cancerous. Still, most solid nodules are not cancer. Some types of solid nodules, such as hyperplastic nodules and adenomas, have too many cells, but the cells are not cancer cells.

Benign thyroid nodules sometimes can be left alone (not treated) and watched closely as long as they're not growing or causing symptoms. Others may require some form of treatment.

Types of Thyroid Cancers

The main types of thyroid cancer are:

- Differentiated (including papillary, follicular and Hürthle cell)
- Medullary
- Anaplastic (an aggressive cancer)

Differentiated thyroid cancers

Most thyroid cancers are differentiated cancers. The cells in these cancers look a lot like normal thyroid tissue when seen in the lab. These cancers develop from thyroid follicular cells.

Papillary cancer (also called *papillary carcinomas* or *papillary adenocarcinomas*): About 8 out of 10 thyroid cancers are papillary cancers. These cancers tend to grow very slowly and usually develop in only one lobe of the thyroid gland. Even though they grow slowly, papillary cancers often spread to the lymph nodes in the neck. Even when these cancers have spread to the lymph nodes, they can often be treated successfully and are rarely fatal.

There are several subtypes of papillary cancers. Of these, the follicular subtype (also called *mixed papillary-follicular variant*) is most common. It has the same good outlook (prognosis) as the standard type of papillary cancer when found early, and they are treated the same way. Other subtypes of papillary carcinoma (columnar, tall cell, insular, and diffuse sclerosing) are not as common and tend to grow and spread more quickly.

Follicular cancer (also called *follicular carcinoma* or *follicular adenocarcinoma*):

Follicular cancer is the next most common type, making up about 1 out of 10 thyroid cancers. It is more common in countries where people don’t get enough iodine in their diet. These cancers usually do not spread to lymph nodes, but they can spread to other parts of the body, such as the lungs or bones. The outlook (prognosis) for follicular cancer is not quite as good as that of papillary cancer, although it is still very good in most cases.

Hürthle (Hurthle) cell cancer (also called *oxyphil cell carcinoma*): About 3% of thyroid cancers are this type. It is harder to find and to treat.

Medullary thyroid carcinoma

Medullary thyroid cancer (MTC) accounts for about 4% of thyroid cancers. It develops from the C cells of the thyroid gland, which normally make calcitonin, a hormone that helps control the amount of calcium in blood. Sometimes this cancer can spread to lymph nodes, the lungs, or liver even before a thyroid nodule is discovered.

This type of thyroid cancer is more difficult to find and treat, There are 2 types of MTC:

- **Sporadic MTC**, which accounts for about 8 out of 10 cases of MTC, is not inherited (meaning it does not run in families). It occurs mostly in older adults and often affects only one thyroid lobe.
- **Familial MTC** is inherited and 20% to 25% can occur in each generation of a family. These cancers often develop during childhood or early adulthood and can spread early. Patients usually have cancer in several areas of both lobes. Familial MTC is often linked with an increased risk of other types of tumors. This is described in more detail in Thyroid Cancer Risk Factors[2].

Anaplastic (undifferentiated) thyroid cancer

Anaplastic carcinoma (also called *undifferentiated carcinoma*) is a rare form of thyroid cancer, making up about 2% of all thyroid cancers. It is thought to sometimes develop from an existing papillary or follicular cancer. This cancer is called *undifferentiated* because the cancer cells do not look very much like normal thyroid cells. This cancer often spreads quickly into the neck and to other parts of the body, and is very hard to treat.

Less Common Thyroid Cancers

Less than 4% of cancers found in the thyroid are thyroid lymphomas, thyroid sarcomas, or other rare tumors.

Parathyroid cancer

Behind, but attached to, the thyroid gland are 4 tiny glands called the *parathyroids*. The parathyroid glands help regulate the body's calcium levels. Cancers of the parathyroid glands are very rare — there are probably fewer than 100 cases each year in the United States.

Parathyroid cancers are often found because they cause high blood calcium levels. This makes a person tired, weak, and drowsy. It can also make you urinate (pee) a lot, causing dehydration, which can make the weakness and drowsiness worse. Other symptoms include bone pain and fractures, pain from kidney stones, depression, and constipation.

Larger parathyroid cancers may also be found as a nodule near the thyroid. No matter how large the nodule is, the only treatment is to remove it surgically. Parathyroid cancer is much harder to cure than thyroid cancer.

Our information on thyroid cancer does not cover parathyroid cancer.

Hyperlinks

1. www.cancer.org/cancer/cancer-basics/what-is-cancer.html
2. www.cancer.org/cancer/thyroid-cancer/causes-risks-prevention/risk-factors.html

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See all references for Thyroid Cancer (www.cancer.org/cancer/thyroid-cancer/references.html)

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Key Statistics for Thyroid Cancer

How common is thyroid cancer?

The American Cancer Society's most recent estimates for thyroid cancer in the United States for 2019 are:

- About 52,070 new cases of thyroid cancer (14,260 in men and 37,810 in women)
- About 2,170 deaths from thyroid cancer (1,020 men and 1,150 women)

The death rate from thyroid cancer has increased slightly in recent years, but remains very low compared with most other cancers. Statistics on survival rates for thyroid cancer are discussed in Survival Rates for Thyroid Cancer[1].

Thyroid cancer is commonly diagnosed at a younger age than most other adult cancers. And women are 3 times more likely to develop thyroid cancer than men.

The chance of being diagnosed with thyroid cancer has risen in recent years and is the most rapidly increasing cancer in the US. It has tripled in the past three decades. Much of this rise appears to be the result of the increased use of thyroid ultrasound, which can detect small thyroid nodules that might not otherwise have been found in the past.

Visit the American Cancer Society's Cancer Statistics Center[2] for more key statistics.

Hyperlinks

1. www.cancer.org/cancer/thyroid-cancer/detection-diagnosis-staging/survival-rates.html
2. https://cancerstatisticscenter.cancer.org/

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American Cancer Society. *Cancer Facts & Figures 2019*. Atlanta, Ga: American Cancer Society; 2019.

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What's New in Thyroid Cancer Research?

Important research into thyroid cancer is being done right now in many university hospitals, medical centers, and other institutions around the country. Each year, scientists find out more about what causes the disease, how to prevent it, and how to improve treatment[1]. In past years, for example, evidence has grown showing the benefits of combining surgery with radioactive iodine therapy and thyroid hormone therapy. The results include higher cure rates, lower recurrence rates, and longer survival.

Genetics

The discovery of the genetic causes of familial (inherited) medullary thyroid cancer now makes it possible to identify family members carrying the abnormal *RET* gene and to remove the thyroid to prevent cancer from developing there.

Understanding the abnormal genes that cause sporadic (not inherited) thyroid cancer has led to better treatments as well. In fact, treatments that target some of these gene changes are already being used, and more are being developed (see below).

Treatment

Most thyroid cancers can be treated successfully. But advanced cancers can be hard to treat, especially if they do not respond to radioactive iodine (RAI) therapy. Doctors and researchers are looking for new ways to treat thyroid cancer that are more effective and lead to fewer side effects.

Radioactive iodine (RAI) therapy

Doctors are looking for better ways to see which cancers are likely to come back after surgery. Patients with these cancers may be helped by getting RAI therapy[2] after surgery. Recent studies have shown that patients with very low thyroglobulin levels 3 months after surgery have a very low risk of recurrence even without RAI. More research in this area is still needed.

Researchers are also looking for ways to make RAI effective against more thyroid cancers. For example, in some thyroid cancers, the cells have changes in the *BRAF* gene, which may make them less likely to respond to RAI therapy. Researchers are studying whether new drugs that target the *BRAF* pathway can be used to make thyroid cancer cells more likely to take up radioactive iodine. These types of drugs might be useful for people who have advanced cancer that is no longer responding to RAI therapy.

Targeted therapies

In general, thyroid cancers do not respond well to chemotherapy. But exciting data are emerging about some newer targeted drugs[3]. Unlike standard chemotherapy drugs, which work by attacking rapidly growing cells (including cancer cells), these drugs attack specific targets on cancer cells. Targeted drugs may work in some cases when standard chemotherapy drugs do not, and they often have different side effects.

Kinase inhibitors: A class of targeted drugs known as *kinase inhibitors* may help treat thyroid cancer cells with mutations in certain genes, such as *BRAF* and *RET/PTC*.

Many of these drugs also affect tumor blood vessel growth.

In many papillary thyroid cancers, the cells have changes in the *BRAF* gene, which helps them grow. Drugs that target cells with *BRAF* gene changes, such as vemurafenib (Zelboraf), dabrafenib (Tafinlar), and selumetinib, are now being studied in thyroid cancers with this gene change.

In one study, giving selumetinib to patients with thyroid cancers that had stopped responding to radioactive iodine (RAI) treatment helped make some patients' tumors respond to treatment with RAI again. It helped patients not only with *BRAF* mutations, but also with mutations in a different gene called *NRAS*.

Other kinase inhibitors that have shown early promise against thyroid cancer in clinical trials include sunitinib (Sutent), pazopanib (Votrient), and axitinib (Inlyta).

Some of these other drugs, such as sunitinib, sorafenib, and pazopanib, are already approved to treat other types of cancer, and might be useful against MTC and differentiated thyroid cancers if other treatments are no longer working.

Anti-angiogenesis drugs: As tumors grow, they need a larger blood supply to get enough nutrients. They get it by forming new blood vessels (a process called angiogenesis). Anti-angiogenesis drugs work by disrupting these new blood vessels. Some of the drugs listed above, such as axitinib, sunitinib, and sorafenib, have anti-angiogenic properties.

Another anti-angiogenesis drug being studied for use against thyroid cancer is bevacizumab (Avastin).

Other targeted drugs: The combination of the chemotherapy drug paclitaxel (Taxol) with the targeted drug efatutazone could be helpful in patients with anaplastic thyroid cancer. Efatutazone targets a receptor called PPAR-gamma.

Observation

The chance of being diagnosed with thyroid cancer has risen rapidly in the US in recent years. Much of this rise appears to be the result of the increased use of thyroid ultrasound, which can detect small thyroid nodules that might not otherwise have been found in the past.

Recent international studies have suggested that some of these newly found, very small thyroid cancers (known as micro-papillary thyroid cancers) may not need to be treated right away but instead can be safely watched. Ongoing clinical trials in the US are now looking at this same approach.

Hyperlinks

1. www.cancer.org/cancer/thyroid-cancer/treating.html
2. www.cancer.org/cancer/thyroid-cancer/treating/radioactive-iodine.html
3. www.cancer.org/cancer/thyroid-cancer/treating/targeted-therapy.html

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See all references for Thyroid Cancer (www.cancer.org/cancer/thyroid-cancer/references.html)

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Written by

The American Cancer Society medical and editorial content team (www.cancer.org/cancer/acs-medical-content-and-news-staff.html)

Our team is made up of doctors and oncology certified nurses with deep knowledge of cancer care as well as journalists, editors, and translators with extensive experience in medical writing.

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