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Thyroid nodules

Signs and symptoms

Most thyroid nodules don't cause signs or symptoms. Occasionally some may become so large that you can feel or even see the swelling at the base of your neck, especially when you're shaving or putting on makeup. Men sometimes become aware of a nodule when their shirt collars suddenly feel too tight.

Some nodules produce too much thyroxine, a hormone secreted by your thyroid gland. The extra thyroxine can cause signs and symptoms such as:

- Sudden, unexplained weight loss
- Nervousness
- Rapid or irregular heartbeat

Although thyroid nodules are seldom cancerous, a nodule is more likely to be malignant if it:

- Grows quickly or feels hard
- Causes you to become hoarse or to have trouble swallowing or breathing
- Causes enlarged lymph nodes under your jaw or in your neck

Causes

Your thyroid gland consists of two lobes that resemble the wings of a butterfly. The lobes are connected by a thin section — think of it as the butterfly's body — called the isthmus. The thyroid takes up iodine from food you eat and uses it to manufacture two main hormones, thyroxine (T4) and triiodothyronine (T3). These hormones maintain the rate at which your body uses fats and carbohydrates, help control your body temperature, influence your heart rate and help regulate the production of protein. Your thyroid gland also produces calcitonin, a hormone that regulates the amount of calcium in your blood.

Just why normal thyroid tissue develops into nodules isn't clear. What is known is that several types of nodules can develop in the thyroid gland:

- **Colloid nodule.** Most thyroid nodules are colloid nodules — benign overgrowths of normal thyroid tissue. You may have just one colloid nodule or many. Although these nodules may grow larger, they don't spread beyond the thyroid gland.
- **Follicular adenoma.** This type of nodule also is benign.
- **Thyroid cyst.** These fluid-filled areas of the thyroid can range in size from less than 1/3-inch in diameter to 1 inch or more. Many thyroid cysts are entirely filled with fluid, but some cysts, called complex cysts, also have solid components. Fluid-filled cysts are usually benign, but complex cysts are sometimes malignant.
- **Inflammatory nodule.** This occasionally develops as a result of chronic inflammation of the thyroid gland (thyroiditis). One rare type of thyroiditis — subacute thyroiditis — causes severe pain in the thyroid gland. Other types are painless and sometimes occur after pregnancy (postpartum thyroiditis).
- **Thyroid cancer.** Although the chances that a nodule is malignant are small, you're at higher risk if you have a family history of thyroid or other endocrine cancers, are younger than 20 or older than 60, are a man, or have a history of head or neck radiation. Malignant nodules are usually large and hard and may cause neck discomfort or pain.
- **Multinodular goiter.** "Goiter" is a term used to describe any enlargement of the thyroid gland. Several factors can lead to a goiter, including the presence of a number of thyroid nodules. This condition, called multinodular goiter, can cause a tight feeling in your throat and difficulty breathing or swallowing.
- **Hyperfunctioning thyroid nodule (toxic adenoma, toxic multinodular goiter, Plummer's disease).** These nodules grow and produce thyroid hormones independent of the influence of thyroid-stimulating hormone (TSH), a substance released by the pituitary gland, which normally regulates the production of thyroid hormones. Hyperfunctioning thyroid nodules cause high blood levels of thyroxine along with low

or nonexistent levels of TSH. A genetic defect of the TSH receptors may play a role in the overactivity of these nodules.

Risk factors

Although the exact cause of most thyroid nodules isn't known, certain factors appear to increase your risk:

- **Heredity.** If a parent or sibling has thyroid nodules, you have a greater chance of developing them as well.
- **Age.** Because the likelihood of developing thyroid nodules increases as you grow older, some changes in thyroid tissue may occur as a normal part of aging.
- **Your sex.** Women are more likely to develop thyroid nodules than men are.
- **Radiation exposure.** In the 1940s and 1950s, children, teenagers and even newborns were often treated with radiation for benign conditions, such as acne or enlarged tonsils. If you once had radiation therapy to your neck or head for conditions such as acne, you have an increased risk of developing thyroid nodules.

  You're also at increased risk if you were exposed to radioactive particles released into the air during atomic weapons testing or in nuclear power plant accidents, such as the 1986 Chernobyl disaster in the former Soviet Union.

- **Certain thyroid conditions.** Nodules are more likely to form in people who have or have had thyroiditis — a chronic inflammation of the thyroid gland.

When to seek medical advice

See your doctor if you notice any unusual swelling in the lower front of your neck, if you have trouble breathing or swallowing, or if you feel you have a lump in your throat. Also seek medical care if you develop signs and symptoms of hyperthyroidism, such as:

- Sudden weight loss even though your appetite is normal or has increased
- A pounding heart
- Trouble sleeping
- Muscle weakness
- Nervousness or irritability

It's important to completely describe the changes you've observed, because many signs and symptoms suggestive of hyperthyroidism may be associated with a number of other conditions.

Screening and diagnosis

Although you sometimes may see or feel a thyroid nodule yourself — usually just below and to the right or left of your Adam's apple — most are discovered when your doctor checks your neck during a routine medical exam. You'll likely be asked to swallow while your doctor examines your thyroid because a nodule in the thyroid gland will usually move up and down during swallowing, whereas a nodule that forms in other parts of your neck won't.

Sometimes a thyroid nodule is detected when you have an imaging test such as an ultrasound or a computerized tomography (CT) or magnetic resonance imaging (MRI) scan to evaluate another condition in your head or neck. Nodules detected this way are usually smaller than those found during a physical exam.

Tests following discovery
Once a nodule is discovered, your doctor will want to determine whether it's malignant or associated with thyroid dysfunction. For that reason, you're likely to have one or more of the following tests:

- **Thyroid function tests.** Your thyroid gland produces two main hormones, thyroxine and triiodothyronine. The rate at which these hormones are released is part of a carefully controlled system involving your thyroid gland, your pituitary gland and your hypothalamus — an area at the base of your brain that acts as a thermostat for this system. Here's how the process works: The hypothalamus signals your pituitary gland to make thyroid-stimulating hormone (TSH). Your pituitary gland then releases TSH — the amount depends on how much thyroxine and triiodothyronine are in your blood. Finally, your thyroid gland regulates its production of hormones based on the amount of TSH it receives.

  Tests that measure blood levels of thyroxine, triiodothyronine and TSH can indicate whether your thyroid is producing too much thyroxine (hyperthyroidism) or too little (hypothyroidism). Although not definitive,

this information is helpful because thyroid nodules are more often benign when blood levels of thyroid hormone are abnormal.

- **Fine-needle aspiration (FNA) biopsy.** This test — FNA biopsy — is the most sensitive for distinguishing between benign and malignant thyroid nodules. During the procedure, your doctor inserts a thin needle — much smaller than the needles used to draw blood — in the nodule and removes a sample of cells. The procedure, which is carried out in your doctor's office, takes about 20 minutes and has few risks. Your doctor is likely to take several samples from a single nodule. If you have more than one nodule, your doctor will usually take samples from these as well. Often, your doctor will use ultrasound to help guide the placement of the needle. The samples are then sent to a laboratory and analyzed under a microscope.

  Most nodules diagnosed using FNA biopsy are benign. These nodules may grow, but they aren't cancerous and won't spread beyond the thyroid gland. A small percentage of biopsied nodules are malignant. This diagnosis is based on the characteristics of individual cells and patterns in clusters of cells that are different from normal thyroid tissue. In some cases, a pathologist can determine specific types of cancer from an FNA biopsy sample.

  Sometimes there may not be enough cells in a sample to accurately determine whether a nodule is benign or malignant. In that case, you're likely to have the test repeated. And in some FNA biopsies, the test results are considered suspicious or indeterminate, which means there's no definitive way to tell from the biopsy sample whether the nodule is cancerous. Repeat biopsies usually aren't helpful in suspicious cases, so the next step is often surgery to remove the nodule for a definitive diagnosis.

- **Ultrasonography.** This imaging technique uses high-frequency sound waves rather than radiation to produce images. It may be used to distinguish cysts from solid nodules to determine if multiple nodules are present and to guide in performing an FNA biopsy.
- **Thyroid scan.** Sometimes you may have a thyroid scan to help evaluate thyroid nodules. During this test, an isotope of radioactive iodine is injected into the vein on the inside of your elbow. You then lie on a table while a special camera produces an image of your thyroid on a computer screen.

  Nodules that produce excess thyroid hormone — called "hot" nodules — show up on the scan because they take up more of the isotope than normal thyroid tissue does. "Warm" nodules look and function like normal tissue, while "cold" nodules are nonfunctioning and appear as defects or holes in the scan. Hot nodules are almost always benign, but a small percentage of warm or cold nodules are malignant.

  The disadvantage of a thyroid scan is that it can't distinguish between benign and malignant warm and cold nodules. The length of a thyroid scan varies, depending on how long it takes the isotope to reach your thyroid gland. You may have some neck discomfort because your neck is stretched back during the scan, and you will be exposed to a small amount of radiation.

Complications

Although most thyroid nodules are benign, they sometimes can cause serious complications. Large nodules or a multinodular goiter can interfere with swallowing or breathing. More serious problems occur when a nodule or goiter produces thyroid hormone, leading to hyperthyroidism.

In addition to signs and symptoms such as unintended weight loss, muscle weakness, heat intolerance, and anxiousness or irritability, hyperthyroidism can also cause the following:

- **Heart-related complications.** These include a rapid heart rate, atrial fibrillation (a heart rhythm disorder) and congestive heart failure — a condition in which your heart becomes too weak to circulate enough blood to meet the needs of your body.
- **Weak, brittle bones (osteoporosis).** The strength of your bones depends, in part, on the amount of calcium and other minerals they contain. Too much thyroid hormone interferes with your body's ability to incorporate calcium into your bones. In fact, hyperthyroidism often affects your bones before you have any other signs or symptoms of the disorder. This is especially true of postmenopausal women who are already at high risk of osteoporosis.
- **Thyrotoxic crisis.** This is a sudden and potentially life-threatening intensification of your signs and symptoms that requires immediate medical care.

Treatment

Working together with your doctor can determine the best thyroid nodule treatment for you. Depending on the type of thyroid nodule you have, your options may include:

- **Watchful waiting.** If an FNA biopsy shows you have a benign thyroid nodule, your doctor may suggest simply watching your condition, which usually means having a physical exam and thyroid function tests at regular intervals. You're also likely to have another biopsy if the nodule grows larger. If a benign thyroid nodule remains unchanged, you may never need treatment beyond careful monitoring. Talk to your doctor if you're not comfortable with this approach or want more information on other options.
- **Thyroid hormone suppression therapy.** This involves treating a benign nodule with levothyroxine (Levoxyl, Synthroid), a synthetic form of thyroxine that you take in pill form. The idea is that supplying additional thyroid hormone will signal the pituitary to produce less TSH, the hormone that stimulates the growth of thyroid tissue. Although this sounds good in theory, levothyroxine therapy is a matter of some debate. There's no clear evidence that the treatment consistently shrinks nodules or even that shrinking small, benign nodules is necessary.

  What's more, levothyroxine therapy isn't without risks. Excess doses can lead to heart problems and osteoporosis, although these problems can usually be avoided with careful monitoring. In addition, levothyroxine therapy isn't recommended for older adults or for people with thyroid cysts or nodules that produce thyroid hormone.
- **Radioactive iodine.** Doctors often use radioactive iodine to treat hyperfunctioning adenomas or multinodular goiters. Taken as a capsule or in liquid form, radioactive iodine is absorbed by your thyroid gland, causing the nodules to shrink and signs and symptoms of hyperthyroidism to subside, usually within two to three months.

  Because thyroid hormone is released into your bloodstream as the nodules are destroyed, in rare cases your symptoms may worsen for a few days or weeks after therapy. You also might experience neck tenderness or a sore throat. And because this treatment eventually causes thyroid activity to slow considerably, you may develop hypothyroidism.
- **Alcohol ablation.** In this procedure, small, hyperfunctioning nodules are injected with ethyl alcohol (ethanol), which helps shrink the nodules and improve symptoms of hyperthyroidism. Although some people may need up to eight injections — usually given at two-month intervals — other people require only one. You receive these treatments on an outpatient basis and unlike some other treatments, alcohol ablation doesn't cause hypothyroidism.

  Side effects of the procedure include headache and burning pain at the injection site that may radiate to the jaw, although the pain rarely lasts more than a few days. In the United States, this therapy is primarily available at referral centers.
- **Surgery.** The usual treatment for malignant nodules is surgical removal, often along with the majority of thyroid tissue — a procedure called near-total thyroidectomy. Occasionally, a nodule that's clearly benign may require surgery, especially if it's so large that it makes it hard to breathe or swallow. Surgery is also considered the best option for people with large multinodular goiters, particularly when the goiters constrict airways, the esophagus or blood vessels. Nodules diagnosed as indeterminate or suspicious by FNA biopsy also need surgical removal so that they can be examined more thoroughly for signs of cancer.

  Risks of thyroid surgery include damage to the nerve that controls your vocal cords and damage to your parathyroid glands — four tiny glands located on the back of your thyroid gland that help control the level of calcium in your blood. After thyroidectomy, you'll need lifelong treatment with levothyroxine to supply your body with normal amounts of thyroid hormone.

By Mayo Clinic Staff
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