A Lump (Nodule) in the Thyroid Gland in Children

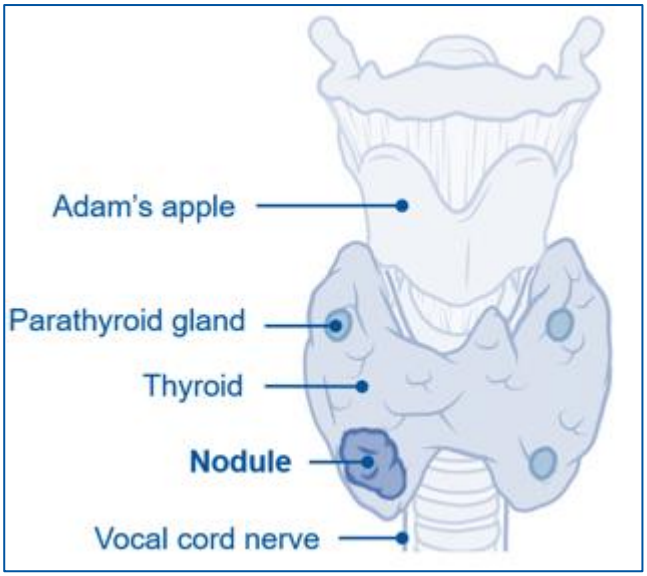
INTRODUCTION

A thyroid lump (nodule) has been detected in your child. This leaflet is about thyroid nodules in children, the examinations that may be performed, and possible treatment options. Every child is unique, so it is possible that an examination or treatment may proceed differently from what is described in this leaflet. Please take your time to read the information, and if you have any questions or if anything is unclear, you can discuss it with the treatment team.

Disclaimer: *This leaflet is a general information guide, written from a Dutch hospital according to European guidelines. Certain procedures or practices may differ locally in other countries or hospitals. The leaflet is written in the 'you' form and is aimed at the patient, but it can also be read by family members, caregivers, and other loved ones involved in the child's care, or by anyone who wants to learn more about thyroid nodules in children. No rights can be derived from the information provided in this leaflet.*

WHAT IS A THYROID NODULE?

The thyroid is a butterfly-shaped organ located at the front of the neck. The thyroid produces hormones that play an important role in metabolism, brain development, and growth in height. A nodule in the thyroid develops due to uncontrolled division of thyroid cells or fluid accumulation (cyst). The cells of a thyroid nodule can be benign or malignant. If a thyroid nodule is malignant, it means thyroid cancer is present. A thyroid nodule is rare in childhood and occurs mainly in teenagers.



A nodule may be discovered because there is a swelling in the neck that someone has noticed, or because you have symptoms such as difficulty swallowing or a hoarse voice. A nodule can also be found incidentally during an ultrasound or scan done for another reason. Enlargement of the entire thyroid is called a goiter. The thyroid can be evenly enlarged (diffuse goiter), for example in cases of an overactive thyroid, or it can be made up of many small lumps (nodules). In the latter case, this is called a multinodular (multi = many) goiter. Most nodules in children

(about 75%) are benign. The reason why a thyroid nodule develops is usually unknown, but in some children a hereditary predisposition plays a role. Radiation to the neck in the past increases the risk of developing thyroid cancer.

SYMPTOMS

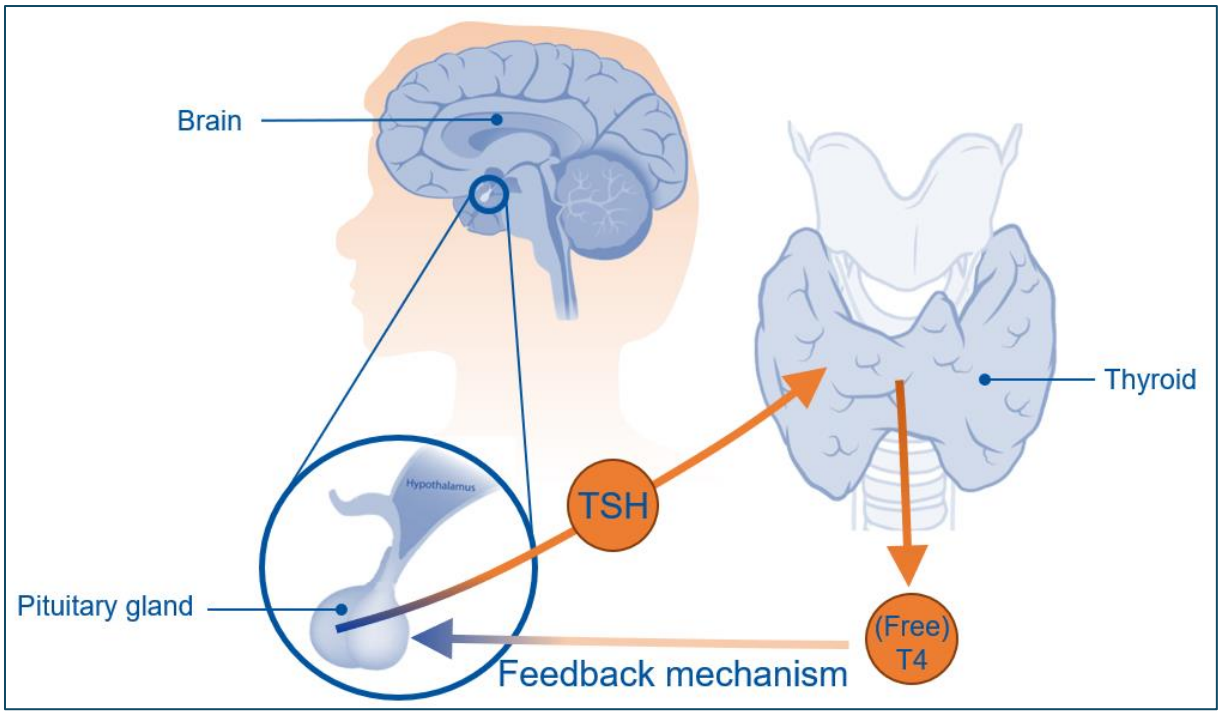
A thyroid nodule usually presents as a swelling or lump in the neck and often causes no other symptoms. Thyroid cancer can also present as enlarged lymph nodes in the neck that feel firm, increase slowly in size, and do not go away. Sometimes a thyroid nodule causes pain in the neck, difficulty swallowing, difficulty breathing, or hoarseness of the voice. The amount of thyroid hormone produced is almost always normal, and children with a thyroid nodule usually have no symptoms of either an excess or deficiency of thyroid hormone. There are nodules, however, that produce thyroid hormone themselves; this is called a *toxic* adenoma or *toxic* multinodular goiter. In such cases, there are usually also symptoms of hyperthyroidism (an overactive thyroid), such as restlessness, feeling on edge, palpitations, increased sweating, diarrhea, and weight loss.

EXAMINATION

When a thyroid nodule is found, it is important to investigate whether it is a benign or a malignant nodule. It is important to examine a thyroid nodule thoroughly to detect and treat possible thyroid cancer at an early stage. In most cases, thyroid cancer in childhood can be treated successfully, and the prognosis is very good. The examination of a thyroid nodule almost always consists of blood tests, ultrasound, and often also a biopsy. Sometimes an additional thyroid scan is performed.

Blood tests

It will be determined in the blood whether the thyroid is producing a normal amount of thyroid hormone (free T4) and TSH (= Thyroid Stimulating Hormone). TSH is produced by the pituitary gland, a small gland in the brain that stimulates the thyroid to release thyroid hormone. In children with a thyroid nodule, thyroid hormone levels are usually normal, but they can also be decreased or increased. Depending on the blood test results, a further plan will be made.



Ultrasound

An ultrasound is performed in the radiology department. The examination is done while lying on an examination table. A clear gel is applied to the neck. The radiologist then moves an ultrasound probe over the neck. On a monitor, the thyroid can be seen in black-and-white images. The ultrasound shows exactly what the thyroid nodule looks like and how big it is, and also assesses the lymph nodes in the neck. You do not need to be fasting for the ultrasound. The examination itself is painless and takes about 30 minutes.

Thyroid biopsy

To determine whether a thyroid nodule is benign or malignant, it may be decided to perform a needle biopsy. This is called a fine-needle aspiration or biopsy. Using the ultrasound, the radiologist locates the thyroid nodule and then uses a thin needle to remove tissue for examination. The needle is used to draw out cells from the nodule. Sometimes it is not possible to obtain enough cells on the first attempt, and another attempt is needed. During the procedure, your child will need to lie very still. A local anaesthetic cream is usually applied to reduce discomfort, making the procedure generally tolerable. In children who are very anxious about needles, the biopsy can sometimes be performed under general anaesthesia.

Note: Procedures may differ slightly depending on the hospital or country. Your doctor or care team will explain exactly how it will be done for your child.

The cells obtained are sent to the pathologist, who examines them under a microscope. About seven to ten days later, your treating physician will give you the results. There are three possible outcomes: 1) only healthy thyroid cells are found without abnormalities (benign nodule); 2) cells are found that are (very likely) malignant (thyroid cancer); 3) the result is uncertain. If the result is uncertain or if too few cells were obtained to make a reliable diagnosis, another biopsy may be necessary.

Thyroid scan

Most children with a thyroid nodule have a normal amount of thyroid hormone in their blood. If the amount of thyroid hormone (free T4) is elevated, a thyroid scan is usually performed. This way, it can be determined whether the entire thyroid is producing too much thyroid hormone, or if the excess thyroid hormone is coming mainly from the nodule. This scan, also called a 'scintigraphy', is performed in the nuclear medicine department. During the scan, radioactive iodine is administered via an intravenous infusion. While you lie on a table that slowly moves through the scanner during the scan, the camera takes images of the neck. The iodine is taken up by thyroid cells, and this can be seen on the images. If the nodule is a toxic adenoma, iodine uptake will be increased in that area while the rest of the thyroid does not take up much iodine. A very low dose of the radioactive substance is used during a thyroid scan, so it does not have any harmful effects on your body. This examination takes about 30 minutes.

TREATMENT

Benign thyroid nodule without symptoms

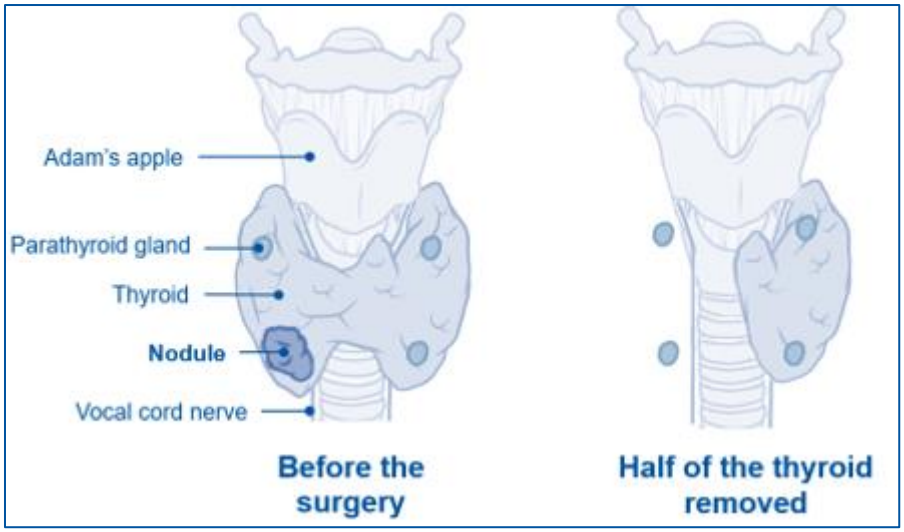
Treatment of a benign thyroid nodule without symptoms is not necessary. However, you should come for follow-up checks every six or twelve months at the hospital, depending on previous results. During these visits, blood tests (free T4 and TSH) and ultrasound of the neck are often repeated. If there are no abnormalities, no treatment is necessary. If the nodule grows larger, a second biopsy may be needed because there is a small risk that a benign nodule may become malignant over time. If there is a thyroid cyst (a fluid-filled cavity) without symptoms, no treatment is needed. Sometimes the cyst disappears entirely after a thyroid biopsy because the fluid is aspirated for examination. Sometimes the size of a cyst suddenly increases due to bleeding inside it, or the cyst gradually fills up again. This may cause symptoms due to the cyst becoming larger. However, this increase in size is often temporary and the symptoms usually resolve by themselves.

Benign thyroid nodule with symptoms

When the thyroid nodule or cyst causes symptoms, for example difficulty swallowing, surgical removal may be considered. The surgeon usually removes half of the thyroid gland (hemithyroidectomy).

Hemithyroidectomy

The surgeon will provide extensive information about the surgery and possible complications during the outpatient clinic visit. On the day of surgery, admission to the pediatric ward takes place. A horizontal scar will appear in the neck, approximately two to three centimeters above the breastbone. Usually, this scar heals nicely and becomes less visible within a neck crease. After the surgery, you will return to the pediatric ward. After a hemithyroidectomy, the hospital stay usually lasts one to two days before discharge home can occur. After removal of half of the thyroid, thyroid hormone levels usually remain adequate. This is monitored after surgery. In about 30% of children, insufficient free T4 is produced after removal of half of the thyroid. This is called (subclinical) hypothyroidism. It can be well treated by giving thyroid hormone in tables. It is important to treat hypothyroidism because if left untreated, it can cause symptoms (such as fatigue, cold intolerance, constipation, weight gain, depressed feelings) and because sufficient thyroid hormone is important for proper growth and development.



Overactive enlarged thyroid due to toxic adenoma or multinodular goiter

Depending on the symptoms, a tailored treatment is chosen. This may include surgery (partial or total thyroid removal), treatment with radioactive iodine, or thyroid-suppressing medication (Strumazol/Thiamazol). The choice of treatment depends on the severity and type of symptoms and characteristics.

Malignant thyroid nodule (thyroid cancer)

Two different types of thyroid cancer occur in childhood:

- Differentiated thyroid cancer
- Medullary thyroid cancer

The tissue of the thyroid gland is composed of structures resembling small sacs: follicles. The follicles contain follicular cells that produce thyroid hormone. Between the follicles lie the C-cells. They produce the hormone calcitonin. Thyroid cancer arising from follicular cells is called differentiated thyroid cancer. The treatment usually consists of surgery to remove the thyroid gland (total thyroidectomy), followed by treatment with radioactive iodine. With this treatment, the prognosis of differentiated thyroid cancer is very good. More information about treatment of differentiated thyroid cancer can be found in the leaflet "**Thyroid Cancer in Children**." Medullary thyroid cancer arises from the C-cells of the thyroid and is very rare in childhood. It has a different course and requires different treatment than differentiated thyroid cancer.