

## Thyroid gland diseases and disorders

The thyroid gland is a butterfly-shaped endocrine gland in the neck. Diseases and disorders of the thyroid gland are far more common than those of the pituitary gland. Literally millions of individuals live with a thyroid disorder. The majority are women. The four main types of thyroid disease are (1) hyperthyroidism, (2) hypothyroidism (see next section), (3) benign thyroid neoplasms, and (4) thyroid cancer. The thyroid gland secretes the following hormones:

- *Thyroxine (T4)* contains iodine and is responsible for cell metabolism and regulates growth.
- *Triiodothyronine (T3)* is a powerful hormone affecting every part of the body including body temperature, growth, heart rate.

### 1. Goiter

#### Description

A *goiter* is an enlargement or hyperplasia of the thyroid gland. A *simple goiter* is any thyroid enlargement that is not caused by an infection or neoplasm and that does not result from another hypothyroid or hyperthyroid disorder. It is classified as endemic or sporadic. ***Endemic or colloid goiter*** is the result of insufficient dietary intake of iodine. ***Sporadic or nontoxic goiter*** follows ingestion of certain drugs or food. Simple goiter is more common in women, especially during adolescence, pregnancy, and menopause. During these times, the body's demand for thyroid hormone is increased.

#### Etiology

The thyroid gland hyperplasia that characterizes a goiter occurs when the thyroid gland cannot secrete sufficient levels of the two iodine-rich hormones: thyroxine (T4) and triiodothyronine (T3). The thyroid gland tissue enlarges to compensate for the deficiency. In simple goiter, the inadequate secretion of these thyroid hormones may be caused by a dietary iodine deficiency, the ingestion of substances known to induce goiter (**goitrogens**), or some error in the hormone formation process within the thyroid gland. Risk factors include being female, over age 40, and having a family history of goiter. In many cases, though, the condition is idiopathic.

#### Signs and Symptoms

The extent of thyroid enlargement varies from case to case. A simple goiter may appear as a small nodule, or it can be quite massive, presenting a conspicuous swollen mass at the front of the neck, just above the sternum (Fig. 1). The goiter shown in Figure 1 is more commonly seen in countries that, unlike the United States, do not put iodized salt in foods. The goiter may compress the esophagus or trachea, producing dysphagia, dyspnea, dizziness, and syncope.



Figure1: Haitian women with non toxic goiter

### **Treatment**

The treatment goal is to reduce the size of the goiter. How this is accomplished depends in part on the underlying cause of the condition. Treatment procedures may include dietary supplements of iodine or T3 and T4 hormone replacement therapy. Sporadic goiter requires avoidance of known goitrogenic foods and drugs. A large goiter that is unresponsive to therapy may require excision, resulting in lifelong thyroid replacement therapy.

### **Prevention**

Prevention of simple goiter includes adequate dietary intake of iodine.

## 2. Graves disease

### Description

*Graves disease* is a condition caused by the oversecretion of hormones by the thyroid gland. Thyroid hormones such as T4 and T3 influence the metabolism of cells throughout the body. Consequently, when levels of these hormones are constantly elevated, as occurs in hyperthyroidism, profound changes can occur in the body's normal physiological processes. Graves disease is the most common form of hyperthyroidism and occurs more frequently in women than in men.

### Etiology

Oversecretion of T3 and T4 influence the metabolism of cells throughout the body. Graves disease may be genetic but is more likely immunologic in nature. The immune system attacks the thyroid gland, causing hypersecretion of its hormones.

### Signs and Symptoms

The classic manifestations of Graves disease are goiter, nervousness, anxiety, loss of sleep, excessive perspiration, and heat intolerance. Wasting of muscle and decalcification of the skeleton may lead to persistent weight loss and fatigue. The disorder may cause a condition known as Graves ophthalmopathy. The ophthalmopathy characteristic of Graves disease includes **exophthalmos** (see Figure 12), protruding eyeballs that give the affected individual a "frightened" appearance. Inflammation of the muscles surrounding the eye may interfere with normal eye movements, including blinking. The dermopathy associated with Graves disease is marked by the appearance of thickened patches of skin, usually on the feet or legs, giving an "orange skin" texture and uneven pigmentation. The symptoms of thyrotoxicosis include a host of cardiac manifestations, such as tachycardia, arrhythmias, heart murmurs, and cardiomegaly. disease process affecting other sites in the body. Thyroid acropachy and pre-tibial myxoedema are caused by cytokines that stimulate the deposition of glycosaminoglycans. Efficient clinical assessment of thyroid status is required.

### Treatment

The course of treatment depends on the affected individual's age and the severity of the case. One approach involves the use of antithyroid agents (i.e., drugs that block hormone synthesis within the thyroid gland). Another approach involves altering the structure of the thyroid gland

itself through either surgery or radioactive iodine therapy. Short-term control of the hyperthyroidism of Graves disease also may be obtained by administration of iodide compounds. Beta blockers can relieve some of the symptoms of Graves disease and are usually prescribed in combination with one of the other treatments. Because treatment causes thyroid activity to decline, most individuals require thyroxine treatment to supply the body with necessary amounts of thyroid hormones.

### **Prevention**

There is no specific prevention for Graves disease.



Figure2: Exophthalmos caused by hyperthyroidism (Graves disease).

## **3. HASHIMOTO THYROIDITIS**

### **Description**

Hashimoto thyroiditis is the most common type of **hypothyroidism**. Inflammation of the thyroid gland also is known as autoimmune thyroiditis. The disease is chronic and more common in women than in men; it was first described by Dr. Hakaru Hashimoto in 1912.

### **Etiology**

Autoimmune thyroiditis, a long-term inflammatory disease, is due to antibodies to thyroid antigens in the blood. When the inflammation causes lymphocytic infiltration, it is called

Hashimoto thyroiditis. Myxedema and Graves disease are both linked to autoimmune thyroiditis. While the cause is essentially unknown, it is probably familial and may appear with other diseases, such as celiac disease and type 1 diabetes.

### **Signs and Symptoms**

There may be moderate thyroid enlargement accompanied by pain and tenderness. Dysphagia may occur. The signs and symptoms are often subtle and mimic other disorders. They include fatigue and excessive sleepiness, depression, cold intolerance, and dry skin and hair.

### **Treatment**

Treatment includes lifelong hormone replacement therapy for hypothyroidism, analgesics, and anti-inflammatory drugs for acute inflammation. Without medication, the thyroid gland is unlikely to be able to carry out its hormonal function. Because there is no way to tell how long the autoimmune process will continue, consistent monitoring of thyroid hormone levels is necessary.

### **Prevention**

There is no known prevention for Hashimoto thyroiditis.

## **4. Cretinism, Myxedema**

### **Description**

*Hypothyroidism*, the undersecretion of hormones by the thyroid gland, is called *cretinism* when it appears as a congenital condition, and it is called *myxedema* when it is acquired later in childhood or during adulthood. Hypothyroidism is a common condition seen in women more than men.

### **Etiology**

Hypothyroidism may be caused by either an insufficient quantity of thyroid tissue or the loss of functional thyroid tissue. The former condition may be iatrogenic, resulting from thyroid surgery, radioactive iodine therapy performed to treat another thyroid disease, or a congenital thyroid abnormality. Inflammation and chronic autoimmune thyroiditis or Hashimoto disease are also common causes. Other forms of hypothyroidism may be caused by dietary or metabolic iodine deficiencies or be induced by certain drugs. Hypothyroidism also may arise secondarily from diseases of the anterior pituitary lobe that result in hyposecretion of TSH.

## **Signs and Symptoms**

Because the thyroid hormones T3 and T4 influence the metabolism of cells throughout the body, persistently low levels of these hormones in hypothyroidism can result in a host of symptoms. The assortment of symptoms varies with the age of the affected individual. Neonates with hypothyroidism may exhibit constipation and feeding problems, may sleep too much, and may have a hoarse cry. The brain and skeleton fail to develop properly without treatment. Children with the condition (either congenital or acquired) typically show retarded growth, a delayed emergence of secondary sexual characteristics, impaired intelligence, and one or more of the adult symptoms of hypothyroidism. The onset of hypothyroidism during adulthood is often insidious. Initial symptoms may include fatigue, constipation, intolerance to cold, muscle cramps, and excessive sleepiness. Later symptoms may include mental clouding, diminished appetite, and weight gain. The skin may become dry, and the hair and nails may become brittle. In advanced forms of the disease, the affected individual may have an expressionless face and sparse hair.

## **Treatment**

Treatment for hypothyroidism usually requires lifelong hormone replacement therapy with synthetic or animal-derived thyroid hormones. In the case of infants and children, therapy should begin as soon as possible to avoid or minimize intellectual impairment.

## **Prevention**

Only hypothyroidism due to dietary iodine deficiency, radiation or surgical removal of the thyroid, and drug induced forms of the disease are preventable.