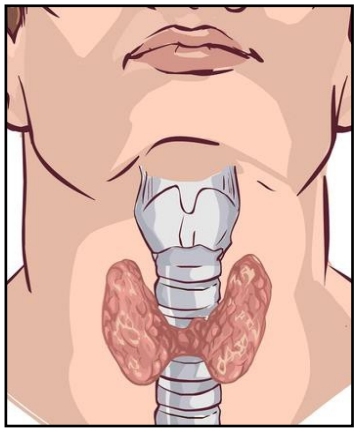
Thyroid Disorders

There are a number of problems associated with the thyroid gland. Hypothyroidism, hyperthyroidism, and thyroid nodules will be presented here.

The thyroid gland is located in the middle of the neck, below the larynx (voice box) and the collarbones. It produces two hormones: triiodothyronine (T3) and thyroxine (T4). These hormones regulate how the body uses and stores energy (metabolism).



Thyroid gland in the neck

The pituitary gland, which is found in the brain, is responsible for controlling the function of the thyroid gland. The pituitary gland produces thyroid stimulating hormone (TSH) which stimulates the thyroid gland to produce T3 and T4.

Thyroid problems are more common in women and increase in incidence with age.

Hypothyroidism

Hypothyroidism is a condition in which the thyroid gland doesn't produce enough thyroid hormone. It is the most common thyroid problem seen.

Causes of hypothyroidism:

- Primary: due to problems in the gland itself = most common problem
  - Autoimmune thyroiditis (Hashimoto's thyroiditis)
  - Thyroid nodules or masses
- Secondary: due to problems in the pituitary gland and includes:
  - Pituitary tumor
  - Post-partum pituitary necrosis (Sheehan's syndrome)
  - Trauma
- Other:
  - Due to medications (such as lithium, amiodarone)
  - Due to surgery on the thyroid gland
  - Due to treatment of overactive thyroid with radioactive iodine treatment
  - Infiltrative disease
    - Fibrous thyroiditis, hemochromatosis, scleroderma, leukemia
  - Iodine deficiency or excess

Symptoms:

Symptoms depend on the level of the thyroid hormone and how quickly the level dropped. Some people have no symptoms and others have severe symptoms and even, rarely, life threatening symptoms. Symptoms can be very non-specific. Usually symptoms are milder when the hypothyroidism develops slowly.

General symptoms include:

- Fatigue, sluggishness
- Weight gain
- Intolerance of cold temperature

Skin changes include:

- Decreased sweating
- Dry, thick skin
- Coarse, thin hair; eyebrows may disappear
- Brittle nails

Eyes:

- Mild swelling around eyes

Heart:

- Slow heart rate and decreased function of the heart
    - Causes fatigue, shortness of breath with exercise
    - Causes swelling in the ankles
    - Can cause high blood pressure
- Cholesterol levels may be elevated

Respiratory system:

- Weaker respiratory muscles and decreased lung function
    - Causes fatigue, shortness of breath
    - Causes decreased ability to exercise
- Sleep apnea
- Swelling of the tongue and hoarse voice

Gastrointestinal system:

- Constipation from slowing of the digestive track

Reproductive system:

- Menstrual cycle irregularities
    - Ranging from absent or infrequent periods to very frequent, heavy periods
    - Can make it difficult to get pregnant
    - Higher chance for miscarriage

Severe hypothyroidism:

- Trauma, infection, cold exposure and some medications can trigger a life-threatening condition called myxedema coma which causes the person to lose consciousness and become hypothermic (low body temperature).

Diagnosis:

Hypothyroidism can be diagnosed by blood tests.

- TSH level – this will be elevated if the thyroid gland is not functioning well.
- Free T4 and free T3 levels – these will be low.

Treatment:

The goal of treatment is to return blood levels of TSH and T4 to the normal range and to control symptoms. Thyroid hormone replacement is taken daily, usually in the form of levothyroxine (T4). T3 is also sometimes added but this drug doesn't last in the body for very long so would need to be taken several times a day. Studies have not shown an advantage to taking both T3 and T4 over taking just T4 alone.

- Thyroid replacement should be taken on an empty stomach
    - High fiber diet, antacids, calcium, and iron tablets interfere with absorption
- Brand names for levothyroxine include Synthroid, Levoxyl, Levothyroid
- Repeat blood tests will need to be checked in 6 to 8 weeks to make sure the prescribed dose is adequate
- Once the optimal dose is determined, levels are usually checked yearly
- Life-long therapy is needed by most people
- Taking too much thyroid supplement can be dangerous:
    - Associated with atrial fibrillation (an irregular heart beat)
    - Can cause accelerated bone loss (osteoporosis)

Hyperthyroidism

Hyperthyroidism is when the body produces too much thyroid hormone due to an overactive thyroid gland. When this happens, the body's metabolism is increased which causes a variety of symptoms.

Causes of hyperthyroidism: Graves' disease:

- Most common cause of hyperthyroidism
- The immune system produces an antibody that stimulates production of excess thyroid hormone
- No known cause but common in many families
- Most common in females between ages 20 and 40 years
- Goiter (enlargement of the thyroid gland) can occur
- Graves' ophthalmopathy (eye problem) often seen:
    - Dry, irritated or red eyes
    - May have double vision
    - Swelling can develop behind or around the eyes causing them to bulge out

Other causes:

- Thyroid nodules can produce too much thyroid hormone
    - These are small growths or lumps in the thyroid gland
- Thyroiditis (lymphocytic or post-partum)
    - The thyroid becomes temporarily inflamed but is not painful. It releases too much thyroid hormone into the blood stream.
- Granulomatous thyroiditis
    - Due to a virus which causes a painful, tender, enlarged thyroid gland. The gland releases too much thyroid hormone into the blood stream. This condition resolves when the viral infection improves but may be followed by several months of hypothyroid symptoms.
- Taking too much thyroid replacement hormone for hypothyroidism

Symptoms:

Most people with hyperthyroidism have one or more of the following symptoms:

- Anxiety, irritability, agitation, trouble sleeping
- Weakness – especially of the upper arms and thighs which makes it difficult to climb stairs or get up from a chair

- Tremors of the hands
- Perspiring more than normal with difficulty tolerating hot weather
- Rapid, forceful, or irregular heartbeats
- Fatigue
- Weight loss in spite of a normal or increased appetite
- Frequent bowel movements
- Some women have irregular menstrual periods or stop having them altogether

Diagnosis:

Hyperthyroidism is typically diagnosed with blood tests. A thyroid scan can also be done to help determine the cause of hyperthyroidism.

- TSH level – this will be low.
- Free T4 and free T3 levels – these will be high.

Treatment:

Medications:

- Antithyroid drugs (methimazole, propylthiouracil) work by decreasing the amount of thyroid hormone that the body makes
- Beta-blockers (atenolol, propranolol, etc.) are often given to control some of the symptoms such as rapid heart rate, tremors, anxiety, and heat intolerance.

Radioactive iodine:

- Radioiodine destroys the thyroid by "ablation". It is given orally and can take 6 to 18 weeks to work.
- After ablation of the thyroid gland, most people will need to take thyroid supplements for the rest of their lives as whatever thyroid gland may be left cannot supply enough hormone to the body.

Surgery

- Surgical removal of the thyroid gland is not the first choice due to risks of damage to the nerves of the voice box and possible damage to the parathyroid glands which regulate the body's calcium balance.
- Surgery is recommended when:
    - The gland is so large that it blocks the airways
    - The antithyroid drugs are not tolerated and the person does not want to use radioactive iodine
    - There is a nodule in the thyroid gland that could be cancer

Thyroid Nodules

Thyroid nodules are round or oval-shaped spots within the thyroid gland. They can be caused by a number of conditions, most are not serious. They are very common; up to half of all people have at least on thyroid nodule.

Symptoms:

Some people never have symptoms related to the nodule(s). The nodule may be found when felt during a routine physical exam. Other symptoms include:

- Feeling or seeing a lump in their neck
- Feeling worried, upset, or having trouble sleeping
- Feeling weak or tired
- Losing weight without trying
- Having a fast heart beat

Diagnosis:

About 95% of all thyroid nodules are caused by benign (non-cancerous) conditions. To determine if a nodule is benign or cancerous, a number of tests are done. These tests include testing the TSH level. Once the TSH level is known, a thyroid ultrasound, thyroid scan, or needle biopsy of the nodule is often needed. If someone has an autoimmune inflammation of the thyroid gland as is seen in Hashimoto's thyroiditis, a test to measure the levels of thyroid antibodies may be done.

Types of nodules and treatment:

Benign thyroid nodules:

- Develop as a result of overgrowth of normal tissue
- May be surgically removed, especially if growing or if over 4 cm in diameter

Malignant thyroid nodules (thyroid cancer):

- Surgery to remove the thyroid gland is done
- Often followed by treatments with radioiodine and thyroid supplement therapy to suppress TSH production

Suspicious for malignancy:

- Biopsy of the nodule sometimes is not adequate to determine if the nodule is cancerous or benign.
- 50 to 75% of these can be malignant therefore surgical removal of the gland is usually done.

"Hot" nodules:

- These absorb radioiodine on nuclear scan thus appear "hot"
- These nodules produce thyroid hormone and do not respond to low levels of TSH to slow thyroid hormone production
- Most always benign
- Can produce enough thyroid hormone to cause hyperthyroidism
- If the person develops hyperthyroidism, usually surgery is done to remove the nodule or radioactive iodine treatment can be done to destroy the nodule

"Cold" nodules:

- These nodules do not absorb radioactive iodine
- About 15 to 20% are cancerous
- Surgical removal is usually done due to the increased risk of cancer

Cystic nodules:

- Usually benign nodules filled with fluid
- Nodule may collapse when fluid is removed
- These are monitored for changes and if they reform or bleed, surgery is often performed to remove the nodule.