

Thyroid Disorders: Hypothyroidism and Hyperthyroidism

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Introduction

The thyroid is a small butterfly shaped gland that lies just under the skin below the Adam's apple in the neck. It measures about 2 inches across. The thyroid gland secretes hormones that help regulate the body's metabolism (how the body uses energy.) There are two main thyroid hormones: T3 (triiodothyronine) and T4 (thyroxine.) T3 is the more active form of hormone, and T4 is converted into T3 by the body as needed. Most of T3 and T4 are bound to proteins in the blood stream. They are inactive until they are separated from the protein. To make these hormones the thyroid gland uses proteins and iodine supplied by the diet. Normally the amount of thyroid hormones that is made and produced is controlled by the pituitary gland. This tiny gland is located at the base of the brain and controls several glands in the body in addition to the thyroid. The pituitary gland is itself controlled by hormones released by the hypothalamus (part of the base of the brain very near the pituitary gland.) The whole system is like a thermostat. For example, when the body senses there is not enough thyroid hormone the hypothalamus releases a hormone TRH (thyrotropin releasing hormone) that causes the pituitary to secrete TSH (thyroid stimulating hormone) that causes the thyroid gland to make and release thyroid hormone. When there is too much thyroid hormone the releasing hormones are turned off and the thyroid stops producing thyroid hormone.

When the thyroid gland is overactive and produces too much thyroid hormone an individual develops hyperthyroidism. When the thyroid gland is under active and produces too little thyroid hormone an individual develops hypothyroidism. A section on each of these topics follows our general review of the thyroid gland.

Individuals with developmental disabilities are more likely to develop thyroid gland disorders than people in the general population. Individuals with Down, Congenital Rubella, Klinefelter and Turner Syndromes are at particular risk. Annual screening of thyroid function should be a routine part of the health maintenance program for all individuals with developmental disabilities.

Diagnosis

When screening for abnormalities of thyroid gland function most doctors will order blood tests that measure the level of TSH (thyroid stimulating hormone) and freeT4. Depending upon the results of these tests and upon the specific thyroid disorder, a number of other tests may be ordered. Some other tests include levels of T3, thyroxine-binding protein, antithyroid antibodies, and serum thyroglobulin. Occasionally tests that evaluate functional responses to stimulation of the thyroid or pituitary glands may be performed. The anatomy of the thyroid gland can be evaluated by a thyroid ultrasound or by a thyroid scan. The scan is done by injecting a minute amount of radioactive iodine into the individual, waiting 30 minutes and then measuring the radioactivity over the thyroid gland (which has the unique capacity of trapping iodine.) The scan produces a picture of the active part of the thyroid gland. A needle biopsy (taking a sample of tissue) or needle aspiration (taking a sample of fluid) from nodules in the thyroid gland can also be done by a physician.

Hypothyroidism

Hypothyroidism is a condition in which the thyroid gland is under active and produces too little thyroid hormone. When the condition is very severe it is sometimes called myxedema because a substance collects in subcutaneous tissues (under the skin) that causes nonpitting edema. About 95% of the time hypothyroidism is the result of malfunction of the thyroid gland itself (primary hypothyroidism.) Causes of primary hypothyroidism can be either, congenital (something an individual is born with) or acquired (something an individual gets.) The most common

causes of primary hypothyroidism are acquired and are the result of destruction of the gland by an autoimmune disease (such as Hashimoto's thyroiditis) or by radioactive iodine therapy or surgery for hyperthyroidism. Other causes of primary hypothyroidism include goiter due to iodine deficiency and too much iodine in individuals with thyroid disease. Some drugs can also cause hypothyroidism including lithium carbonate, para-aminosalicylic acid, thiourea drugs, sulfonamides, phenylbutazone and others. Decades ago congenital hypothyroidism was a common cause of mental retardation and severe disability in affected children. Now thanks to newborn screening, most babies with this condition are diagnosed early, treated and the most devastating consequences of the disease are avoided. About 5% of the time hypothyroidism is the result of a problem outside of the thyroid gland itself (secondary hypothyroidism.) Tumors or other abnormalities of the hypothalamus or pituitary gland are examples of conditions that can cause secondary hypothyroidism. Rarely an individual's tissues are resistant to thyroid hormone.

Symptoms

Too little thyroid hormone causes the body's metabolism to slow down. Symptoms of hypothyroidism usually develop slowly and can be fairly subtle at first. Often the individual seems depressed. The facial expression seems dull and their face looks puffy or swollen. There is often weight gain. The skin becomes coarse, dry and scaly while the hair becomes dry and sparse. The voice sounds hoarse, and hearing may be impaired. There is constipation, cold intolerance, generalized aches and pains, weakness, tiredness and sleepiness. Some people appear confused, forgetful or even demented. When very severe hypothyroidism can cause anemia, low body temperature, heart failure, and life threatening myxedema coma.

Treatment

Hypothyroidism is an easily treated disease. Several preparations for thyroid replacement are on the market. The most frequently prescribed is Synthroid (levothyroxine.) Other preparations include Liotrix, Desiccated Thyroid, and Levotriiodothyronine. Regulating the dose of thyroid replacement hormone may take a few weeks and several blood tests to determine if the correct amount of medication is being given. After thyroid function is back to normal the doctor will want to monitor therapy by checking serum free T4, TSH and T3 levels annually.

Emergency Situations – What can go wrong?

Symptoms of hypothyroidism develop slowly and acute emergency situations are very rare. Since we know now that individuals with developmental disabilities are more prone to thyroid disorders than other people, we hope that physicians are checking thyroid function every year as part of health maintenance of every individual with a developmental disability. Early diagnosis and treatment is the solution to avoiding the only potentially life threatening complication of untreated hypothyroidism that is myxedema coma. In myxedema coma the breathing slows, the person has seizures and blood supply to the brain is decreased. It can be triggered by cold exposure, infection, trauma or medications like sedatives or tranquilizers.

What to do?

1. Suspect hypothyroidism long before any of these symptoms occur so it can be diagnosed and treated early.
2. If an individual presents to you with the symptoms of myxedema coma call 911 for immediate transport to a hospital emergency room.

Hyperthyroidism

In hyperthyroidism the thyroid gland is overactive and produces too much thyroid hormone. Over 2 ½ million Americans have hyperthyroidism. It is much more common in women than in men.

There are several causes of hyperthyroidism. The most common include immunologic conditions (like Graves' disease and thyroiditis,) toxic thyroid nodules (adenomas), and toxic multinodular (many nodules or adenomas) goiter (enlargement of the thyroid gland.) Graves disease is a syndrome of hypermetabolism, enlarged thyroid gland and exophthalmous (bulging of the eyeballs due to the collection of abnormal substances in the tissues of the orbit.) Autoimmune thyroiditis is an inflammation of the thyroid gland that may cause damage to the gland and eventually result in hypothyroidism. Thyroid nodules (one or many) are areas of abnormal thyroid tissue within the thyroid gland. They can be benign or malignant (cancer) but most are benign (not cancer.)

Symptoms

Too much thyroid hormone speeds up metabolism and the symptoms can be dramatic. The heart pounds rapidly and may develop an irregular beat (arrhythmia.) Blood pressure goes up. The individual loses weight despite an increased appetite. There is usually heat intolerance and excess sweating, diarrhea, sleep disturbance, and muscle weakness. Many individuals feel nervous, tremulous (shaky) and emotionally labile. The skin feels smooth, warm and moist. With Graves' disease there may be mild or marked bulging of the eyes that leads to irritation, drying, inflammation, and increased sensitivity to light. Some individuals with hyperthyroidism develop a very severe form of this condition that is called thyroid storm. Thyroid storm may be brought on by stress or infection. All the symptoms of hyperthyroidism seem to be exaggerated. The individual may also have a fever and abdominal (stomach) pain. He/she may be delirious, obtunded ("out of it") or psychotic. Twenty to 40% of people with thyroid storm die. This is a true medical emergency that must be treated intensively in a hospital setting.

Treatment

Treatment of hyperthyroidism depends upon the cause of the condition. Several options are available including medications, radioactive iodine therapy and surgery. Antithyroid medications used to treat hyperthyroidism include propylthiouracil (PTU) and methimazole (Tapazole.) They have several unpleasant side effects including rash, damage to white blood cell production (agranulocytosis,) liver damage and inflammation of blood vessels (vasculitis.) The doctor will monitor the white blood cell count (WBC) and liver function tests (LFTs) on a regular basis as long as the patient is taking one of these drugs. Very often treatment will be done in two stages. In the short-term, antithyroid drugs will be prescribed to decrease the production and release of thyroid hormone. Plenty of rest, good nutrition and stress management are also important pieces of the initial management of hyperthyroidism. Sometimes B-adrenergic blocking agents (like Propranolol) are prescribed to reduce the symptoms of hyperthyroidism during this phase of treatment. These medications slow down the heart rate, reduce the shakiness and control anxiety. Some patients (10-20%) may go into remission with this therapy. Most will need to be reassessed between 12-18 months and a decision made about long-term management. Options for long-term management include continuation of antithyroid medication, surgery or radioactive iodine therapy. It is up to the individual and the physician to decide the best method of treatment in each case. Individuals with eye involvement will need to be followed by an ophthalmologist.

Emergency Situations – What can go wrong?

The most serious, life-threatening complication of hyperthyroidism is thyroid storm. This condition can be precipitated by infection or extra stress in an individual who has hyperthyroidism. Many of the symptoms of hyperthyroidism are exaggerated.

1. Racing heart
2. Palpitations
3. Excessive sweating
4. High fever
5. High blood pressure

6. Abdominal pain

What to do?

1. When a marked increase in the symptoms noted above occurs in an individual with hyperthyroidism, suspect thyroid storm.
2. Notify the individual's PCP or endocrinologist.
3. Call 911 for transport to the hospital. Thyroid storm requires intensive in-patient hospital treatment.

Conclusion

Abnormalities of thyroid gland function are more common among individuals with developmental disabilities than in the general population. Most will have either hypothyroidism (underactive thyroid function) or hyperthyroidism (over active thyroid function.) Both conditions are treatable. Onset of hypothyroidism can occur over a fairly long time and the symptoms can be subtle. In contrast, onset of hyperthyroidism is usually more rapid and the symptoms are often dramatic. If we can keep the possibility of abnormal thyroid function in mind we will not be likely to miss the diagnosis. Screening tests of thyroid function should be a part of routine health maintenance for all individuals with a developmental disability.

References

Cecil Textbook of Medicine, 19th Edition, W.B.Saunders Company, 1992 pp.1248-1271.

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