

Low Thyroid Levels

(Known as Hypothyroidism)

The thyroid and its function

The thyroid gland is located in the lower front of the breathing airway and below the voice box. It is composed of a right and left lobe which lie on either side of the trachea (windpipe) and is shaped like a small butterfly. Its function is to produce two hormones that regulate the body's growth, development, metabolism and maintenance. They are also critical for nervous, skeletal and reproductive tissue as well as regulating the body's temperature, heart rate, weight and cholesterol. When the thyroid gland is unable to produce sufficient amounts of the two main hormones, T4 and T3, then a wide range of problems can arise throughout the body.

Both T4 and T3 are produced when the thyroid stimulating hormone (TSH) is released from the anterior pituitary gland (located at the base of the brain) in response to low levels of these circulating hormones. Iodine is also essential for the production of these hormones.

Hypothyroidism

Hypothyroidism is a common endocrine disorder resulting from a deficiency of thyroid hormones T3 and T4. It has profound effects on the cardiovascular system, the endocrine system, nervous system, and brain. Since several pituitary hormones are affected by hypothyroidism including prolactin, LH, and FSH, this will also cause sexual problems including reduced libido, erectile dysfunction, and fertility problems.

1% to 10% of the global population suffer from hypothyroidism. On average it affects 1 in 50 women and about 1 in 1000 men at some stage in their lives. The condition is much more common in adult women and becomes more common with increasing age. However, it can occur at any age and can affect anyone. The most severe forms of hypothyroidism are congenital, leaving newborn children with growth failures and permanent intellectual disability if not treated within the first few weeks of life. Congenital hypothyroidism affects about one in 4,000 births and is the most treatable cause of mental retardation.

Causes

Hashimoto's Thyroiditis

The most common cause of hypothyroidism is Hashimoto's thyroiditis which is an autoimmune disease which may be associated with goitre (swollen thyroid which is seen as a swelling in the neck). An autoimmune condition occurs when the body produces antibodies against its own tissues. With autoimmune thyroiditis the immune system produces antibodies which mistakenly attack the thyroid gland affecting its function. The trigger that stimulates the immune system to produce antibodies is not yet known. It is not unusual to find patients with Hashimoto's thyroiditis having other autoimmune conditions such as diabetes or vitamin B12 deficiency.

Thyroid destruction - radioactive iodine or surgery

Up to half of the patients who receive radioactive iodine treatments for an overactive thyroid develop hypothyroidism within a year of therapy. This is the standard treatment for Graves' disease, which is the most common form of hyperthyroidism, a condition caused by excessive secretion of thyroid hormones.

Other forms of treatment for overactive thyroid glands include either anti-thyroid drugs or removal of the thyroid during surgery which results in hypothyroidism.

Patients who have complete removal of the thyroid to treat thyroid cancer need lifetime treatment with thyroid hormone. Removing one of the two lobes of the thyroid gland usually because of benign growths on the thyroid gland can result in hypothyroidism. The remaining thyroid lobe will generally grow so that it can produce sufficient amounts of thyroid hormone for normal function.

Drug-induced hypothyroidism

Hypothyroidism can be caused as a result of treatment for hyperthyroidism with certain medicines such as Carbimazole (Neo-mercazole[®]) or propylthiouracil.

Some prescription medications can also alter the function of the thyroid, resulting in low blood levels of thyroid hormones.

These medicines include:

Lithium: a drug widely used to treat psychiatric disorders, has effects on thyroid hormone production and secretion. Up to 50% of patients who take lithium develop a goitre (swollen neck); with 20% developing symptomatic hypothyroidism, and another 20 - 30% developing hypothyroidism without symptoms.

Amiodarone (Cordarone X[®]): a drug which is used to treat abnormal heart rhythms, contains high levels of iodine (one 100mg tablet contains 250 times the recommended daily intake) and can induce hyper or hypothyroidism.

Other Drugs: Drugs used for treating epilepsy, such as phenytoin and carbamazepine, can reduce thyroid levels. Certain antidepressants may cause hypothyroidism, although this is very rare. Interferons and interleukins are used for treating conditions such as hepatitis and multiple sclerosis can affect thyroid level. Evidence suggests that these drugs increase antibodies that put patients at risk for hyper or hypothyroidism. Some drugs used in cancer chemotherapy, such as sunitinib (Sunent[®]) or imatinib (Gleevec[®]), can also cause or worsen hypothyroidism.

Iodine deficiency

In some areas of the world where there is an iodine deficiency in the diet, severe hypothyroidism can be seen in 5% to 15% of the population. Examples of these countries include Zaire, Ecuador, India, and Chile. Only severe iodine deficiency will cause low thyroid hormone levels. Since the addition of iodine to our table salt and bread, iodine deficiency is rarely seen in western populations.

Symptoms

The early symptoms of hypothyroidism are often mild, they may barely be noticed and include fatigue and sluggishness. Many people incorrectly attribute these symptoms to stress or aging. As thyroxine hormone levels continue to fall over months or years the symptoms gradually worsen and become more obvious as body functions start to slow down.

General symptoms that commonly occur include:

- Fatigue
- Sluggishness
- Increased sensitivity to cold
- Constipation
- Pale dry skin

- Depression
- Unexplained weight gain and water retention
- Muscle aches, tenderness and stiffness
- Slowed thinking and mental activity
- Pain, stiffness or swelling in the joints
- Infertility
- Brittle fingernails and hair
- Goitre (enlarged thyroid gland)
- Menstrual periods that are irregular or heavier than normal
- Loss of sex drive
- Lower body temperature
- Bradycardia (low heart rate)

Late symptoms if left untreated include:

- A puffy face
- Hoarse voice
- Carpal tunnel syndrome (pains and numbness in the hands)
- Slow speech
- Decreased taste and smell
- Thickening of the skin
- Thinning of the eyebrows

When hypothyroidism is not treated, the symptoms will gradually become more severe. A condition known as myxedema coma is rare, but when it occurs it can be life-threatening. Signs and symptoms include low blood pressure, decreased breathing, decreased body temperature, unresponsiveness and even coma. In extreme cases, myxedema can be fatal.

Diagnosis

Hypothyroidism can be diagnosed through a normal blood test for TSH, T3 and T4. It is important to measure all these hormones because a single hormone will not give a precise diagnosis. When hypothyroidism is present, blood levels of T3 and T4 are usually decreased and TSH is usually elevated. However, in early hypothyroidism, the levels of T3 and T4 may be normal. Therefore measuring serum levels of TSH is important.

If the levels of T3 and T4 in the blood are low, then the pituitary releases more TSH to try to stimulate the thyroid gland to make more. Therefore, a raised level of TSH means the thyroid gland is underactive and is not making enough T3 and T4. Low levels of T4 can also confirm hypothyroidism.

However, some people have a raised TSH but have a normal T4. This means that you are making enough T3 and T4 but the thyroid gland needs extra stimulation from TSH to make the required amounts of T3 and T4. In this situation you have an increased risk of developing hypothyroidism in the future.

Treatment for Hypothyroidism

Replacement therapy is the main treatment for Hypothyroidism. This is achieved by replacing T4 with its synthetic derivative. Usually the drug of choice is levothyroxine sodium and this helps normalise blood levels of TSH, T4, and T3. The replacement therapy is usually life long and symptoms usually start to improve within the first six weeks of treatment. Levothyroxine is taken once a day. Eltroxin[®] is the most common brand of levothyroxine available in Ireland.

Dosage of Levothyroxine

Doctors will normally prescribe the lowest dose of levothyroxine to start and gradually increase the dose over a few months according to thyroxine levels in the blood to achieve effective relief of symptoms. Once the correct dose of levothyroxine has been established, hormone levels should be monitored at least once every year. The average dose for adults with hypothyroidism is approximately 1.6mcg/kg/day. Hence the average dose is 100 to 150 mcg per day. Children may require higher doses, usually between 2.5 to 5 mcg/kg/day. Older patients may need less than 1 mcg/kg/day. For those patients who are older than 50 years, or in younger patients with a history of cardiac disease, a lower initial dosage is advised, starting with 25 to 50 mcg of levothyroxine daily, with clinical re-evaluations at 6 to 8 week intervals and gradual increases in dose until TSH levels are normal.

How to take Levothyroxine

Levothyroxine tablets should be taken daily. Ideally, the tablet should be taken on an empty stomach (before breakfast) and one hour before any other medicines such as fibre supplements, calcium, iron, multivitamins, aluminium hydroxide antacids, colestipol or medicines that bind bile acids. This is because some foods/medicines rich in calcium or iron may interfere with the absorption of levothyroxine in the gut.

Missed a tablet?

Everyone forgets to take their tablets at some stage. While it is not advisable to regularly miss doses of thyroxine, the hormone remains in the body for several days, so one missed dose should not cause any noticeable decline in well-being. You can take your missed tablet as soon as you remember. However, do not take a double dose the next day to try to compensate. You should try to take your tablet each morning for maximum benefit.

Problems with Levothyroxine Treatment

Because levothyroxine is identical to the thyroxine the body manufactures, side effects are usually rare. However, over or under dosing is common. Overdosing can cause symptoms of hyperthyroidism. Too much thyroid hormone increases the risks of abnormal heart rhythms, rapid heartbeat, heart failure, and possibly even a heart attack if the patient has underlying heart disease. Long-term treatment can slightly increase the risk of osteoporosis.

Drug Interactions with Levothyroxine

Many drugs interact with levothyroxine and may either enhance or reduce its absorption. Drugs which reduce levothyroxine absorption include;

- Amphetamines
- Anticoagulants (blood thinners)
- Tricyclic antidepressants
- Anti-anxiety drugs
- Arthritis medications
- Aspirin
- Beta blockers
- Insulin
- Oral contraceptives

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- Digoxin
- Certain cancer drugs
- Iron replacement therapy
- Calcium carbonate and aluminium hydroxide

Levothyroxine should be taken at least four hours apart from these medications.

Other drugs such as anticonvulsants (phenytoin, phenobarbital, carbamazepine) and rifampin (antibiotic used to treat tuberculosis) may accelerate levothyroxine metabolism, requiring higher doses of levothyroxine.

Disclaimer: Please ensure you consult with your healthcare professional before making any changes recommended

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