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MODERN APPROACHES TO THE DIAGNOSIS AND LONG-TERM MANAGEMENT OF HYPOTHYROIDISM AND HYPERTHYROIDISM IN CLINICAL PRACTICE

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Abstract: Hypothyroidism and hyperthyroidism are among the most common endocrine disorders associated with thyroid gland dysfunction and are frequently encountered in clinical practice. Effective management of these conditions requires accurate diagnosis, individualized treatment strategies, and long-term follow-up. Subclinical hypothyroidism carries a risk of progression to overt disease over time, while hyperthyroidism, especially in elderly patients, may be complicated by cardiac arrhythmias and decreased bone density.

Levothyroxine is the mainstay of treatment for hypothyroidism, and its dosage is determined individually based on laboratory parameters. The management of hyperthyroidism depends on the etiology and the patient’s general condition and may include pharmacological therapy, radioactive iodine treatment, or surgical intervention. This article analyzes the importance of a patient-centered approach, individualized therapy, and monitoring in the management of thyroid diseases based on modern scientific sources.

Keywords: Hypothyroidism, Hyperthyroidism, Thyroid dysfunction, Levothyroxine therapy, Graves’ disease, Thyroiditis, Subclinical hypothyroidism

Introduction

Thyroid diseases, including hypothyroidism and hyperthyroidism, are among the most common endocrine disorders in modern medical practice. These conditions significantly affect metabolic processes in the body, thereby influencing patients’ quality of life and daily functioning. Epidemiological data indicate that hypothyroidism affects a considerable proportion of the population, with subclinical forms being even more prevalent. The disease is more common in women, and its development is influenced by age, gender, ethnicity, and iodine intake.

Although hyperthyroidism is less common, it can lead to serious long-term complications, including cardiovascular disorders and decreased bone density. Therefore, early diagnosis and proper management of these conditions are of great importance.

General practitioners play a crucial role in identifying thyroid disorders, initiating treatment, and providing long-term patient monitoring. Advances in modern laboratory and instrumental diagnostic methods allow for individualized assessment and the application of patient-centered treatment strategies.

This article analyzes the etiology, diagnosis, treatment methods, and long-term monitoring of hypothyroidism and hyperthyroidism based on contemporary scientific literature.

Causes of Hypothyroidism

Hypothyroidism develops as a result of decreased production of thyroid hormones by the thyroid gland. Based on etiology, it is classified into primary, secondary, and transient forms. Primary hypothyroidism is directly related to thyroid gland dysfunction, whereas secondary

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hypothyroidism results from disorders at the level of the pituitary or hypothalamus. In some cases, hypothyroidism is transient and is often associated with the postpartum period or subacute thyroiditis.

From an epidemiological perspective, iodine deficiency remains one of the leading causes of hypothyroidism worldwide. However, in iodine-sufficient regions, the disease is more commonly associated with autoimmune processes, particularly Hashimoto's thyroiditis. In this condition, the immune system produces antibodies against thyroid tissue, leading to gradual functional decline of the gland.

Hypothyroidism may also develop due to other factors. For example, treatment with radioactive iodine or surgical removal of the thyroid gland can significantly reduce hormone production. Certain medications, such as amiodarone, lithium, interferons, and thionamides, may negatively affect thyroid hormone synthesis. Additionally, congenital anomalies, including thyroid agenesis or genetic defects, are important causes of hypothyroidism. In rarer cases, infiltrative diseases such as amyloidosis and hemochromatosis can damage thyroid tissue.

Subclinical Hypothyroidism

Subclinical hypothyroidism represents an early stage of thyroid dysfunction characterized biochemically by elevated thyroid-stimulating hormone (TSH) levels with normal free thyroxine (FT4) levels. This condition often presents without clear clinical symptoms, and many patients feel healthy. However, some individuals may experience nonspecific symptoms such as fatigue, weight gain, constipation, cold intolerance, and dry skin.

Determining the etiology of subclinical hypothyroidism requires assessment of thyroid antibodies, particularly anti-thyroid peroxidase (anti-TPO) antibodies. The presence of these markers helps confirm the autoimmune nature of the disease and indicates an increased risk of progression.

Clinical observations show that subclinical hypothyroidism progresses to overt hypothyroidism in approximately 5% of cases annually, especially in patients with positive anti-TPO antibodies. Therefore, regular monitoring is essential even in asymptomatic patients. Typically, annual evaluation of thyroid function is recommended.

Levothyroxine (LT4) Therapy

Levothyroxine (LT4) is the primary and first-line treatment for hypothyroidism. It compensates for deficient thyroid hormones and helps normalize metabolic processes. In adults, the full replacement dose is usually weight-based, averaging 1.6 μg/kg per day, although dosing must be individualized for each patient.

Thyroid-stimulating hormone (TSH) levels serve as the main parameter for evaluating treatment effectiveness and adjusting dosage. After initiating LT4 therapy or modifying the dose, it is recommended to wait at least 6–8 weeks before rechecking TSH levels, as the hormone has a long half-life and requires time to reach steady-state levels.

To ensure optimal absorption, levothyroxine should be taken on an empty stomach in the morning, approximately 30–60 minutes before breakfast. Concurrent intake with iron or calcium supplements and certain other medications may reduce absorption, so they should be taken separately.

In elderly patients and those with cardiovascular diseases, treatment should be initiated cautiously. Lower starting doses (typically 25–50 μg/day) are recommended, followed by gradual increases based on clinical and laboratory findings.

Combination T4/T3 Therapy

In some cases, monotherapy with levothyroxine (LT4) may not provide sufficient clinical improvement. In such situations, combination therapy with triiodothyronine (T3) may be considered. However, this approach should only be applied in selected patients who do not respond to standard therapy and under specialist supervision.

The use of desiccated thyroid extracts is not supported by current clinical guidelines, as they contain supraphysiological levels of T3 and may increase the risk of adverse effects.

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Correct selection of drug dosage is of great importance in the treatment of hypothyroidism, as both excessive and insufficient therapy may lead to various complications. Excessive intake of levothyroxine results in suppression of thyroid-stimulating hormone (TSH) levels below the normal range, which increases the risk of cardiac arrhythmias, particularly atrial fibrillation, as well as decreased bone mineral density (osteoporosis), especially in elderly patients.

Conversely, inadequate dosing leads to persistence or worsening of clinical manifestations of hypothyroidism. In such cases, patients may experience general fatigue, cognitive impairment, and an increased risk of cardiovascular diseases.

During pregnancy, the requirement for thyroid hormones increases. Therefore, in women with hypothyroidism, it is recommended to increase the levothyroxine dose by approximately 25% immediately after pregnancy is confirmed. Regular monitoring of TSH and FT4 levels is essential to maintain them within pregnancy-specific reference ranges.

Causes of Hyperthyroidism

Hyperthyroidism is characterized by excessive production of thyroid hormones by the thyroid gland, leading to an acceleration of metabolic processes in the body. Its etiology is diverse, and several main causes are distinguished in clinical practice.

The most common cause is Graves' disease, which has an autoimmune nature. In this condition, antibodies against thyroid-stimulating hormone receptors (TRAb) continuously stimulate the thyroid gland, resulting in excessive hormone production.

In addition, toxic nodular changes play an important role in the development of hyperthyroidism. In such cases, certain parts of the thyroid gland (e.g., autonomous adenoma or multinodular goiter) produce hormones independently of the body's regulatory mechanisms.

Another important group of causes includes thyroiditis, which may present in autoimmune (painless lymphocytic), postpartum, or viral (subacute) forms. In these cases, hormones are not overproduced but are released into the bloodstream due to inflammation of the gland, and the process is usually temporary. Certain medications, including amiodarone and interferons, may also affect thyroid function and induce hyperthyroidism.

Diagnosis of Hyperthyroidism

Laboratory and instrumental investigations play a crucial role in diagnosing hyperthyroidism. First, the levels of thyroid-stimulating hormone (TSH), free thyroxine (FT4), and free triiodothyronine (FT3) are measured. To confirm Graves' disease, testing for TRAb antibodies is recommended. If subacute thyroiditis is suspected, it is important to assess inflammatory markers, particularly C-reactive protein (CRP).

Instrumental diagnostic methods also help determine the cause of the disease. Radionuclide studies are used to evaluate the functional activity of the thyroid gland and to detect nodular changes. Ultrasonography is generally used as an additional method and is performed only when necessary.

Management of Graves' Disease

Three main approaches are used in the treatment of Graves' disease: antithyroid drugs, radioactive iodine therapy, and surgical intervention.

Antithyroid drugs, particularly thionamides, are usually used as first-line therapy. Carbimazole is often preferred due to its relatively lower hepatotoxicity. Propylthiouracil is used during the first trimester of pregnancy and in cases of thyroid storm. The main goal of treatment is to achieve a euthyroid state and maintain long-term remission. Although rare, serious adverse effects such as agranulocytosis may occur.

Radioactive iodine (I-131) therapy is an effective method, leading to euthyroidism or hypothyroidism within one year in most patients. However, this method is contraindicated in pregnant women and in patients with severe Graves' orbitopathy. In some cases, corticosteroids are recommended to reduce the risk of orbitopathy.

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Surgical treatment (thyroidectomy) is preferred in cases of large or compressive goiter, suspicion of malignancy, or when pregnancy is planned in the near future. To minimize complications, surgery should be performed by an experienced surgeon.

The management of Graves' disease is patient-centered, and the choice of therapy depends on disease characteristics, patient preferences, and available medical resources. Nevertheless, some patients may continue to experience fatigue or eye-related symptoms even after treatment.

Management of Toxic Nodules

Toxic nodules usually develop slowly and are initially detected by decreased TSH levels in laboratory tests. The choice of treatment depends on the patient's condition and clinical findings.

Radioactive iodine therapy is one of the most effective methods and often allows achieving euthyroidism without additional medications. Surgical intervention is preferred in cases of large or compressive goiter.

In some patients, particularly elderly individuals or those who decline radioactive therapy, long-term treatment with thionamides may be applied. Alternative methods such as percutaneous ethanol injection or laser therapy also exist, but their use in practice is limited.

Management of Thyroiditis

Thyroiditis is often associated with transient hyperthyroidism, and antithyroid drugs are usually ineffective. Treatment is symptom-based: beta-blockers are used for tachycardia and tremor, while corticosteroids may be indicated in painful or prolonged subacute thyroiditis.

The hypothyroid phase is usually transient, and levothyroxine may be required for a short period (3–6 months). Even subclinical hyperthyroidism, especially in elderly patients, increases the risk of osteoporosis and atrial fibrillation. Weight gain may occur after treatment, so attention to diet and lifestyle is essential.

Conclusion.

Thyroid dysfunctions, particularly hypothyroidism and hyperthyroidism, are common in clinical practice and have a significant impact on patients' quality of life. In hypothyroidism, levothyroxine (LT4) is used as the first-line therapy, and the dosage should be carefully adjusted according to thyroid-stimulating hormone (TSH) levels. Hyperthyroidism, on the other hand, is managed with antithyroid medications, radioactive iodine, or surgery, depending on the patient's condition and preferences.

Subclinical forms of thyroid disorders may also carry long-term risks; therefore, regular monitoring is essential. A patient-centered approach, individualized decision-making, and long-term follow-up are key principles in achieving favorable outcomes in thyroid disease management.

Post-treatment follow-up, dose adjustment, and lifestyle support can significantly improve patients' overall health and quality of life.

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