

# An Overview of the Effectiveness of Treatment for Hyperthyroidism and Hypothyroidism

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Date of Submission: 05-06-2024

Date of Acceptance: 15-06-2024

## ABSTRACT:

This review examines the current landscape of treatment options, their efficacy, and considerations in the management of hypothyroidism and hyperthyroidism. Hypothyroidism and hyperthyroidism are common endocrine disorders affecting millions worldwide. Effective management is crucial to mitigate symptoms, prevent complications, and improve quality of life.

**KEY WORDS:** Hyperthyroid, hypothyroid, cardiovascular, palpitations, exophthalmus, hoarseness

## I. INTRODUCTION:

Thyroid disorders encompass a spectrum of conditions, with hypothyroidism characterized by insufficient thyroid hormone production and hyperthyroidism by excessive hormone secretion. Treatment strategies aim to normalize thyroid function, alleviate symptoms, and address underlying causes. This review evaluates the effectiveness of various interventions in achieving these goals.

Thyroid disorders, among the most prevalent endocrine conditions worldwide, encompass a diverse array of dysfunctions in thyroid hormone synthesis, secretion, or action, profoundly impacting physiological homeostasis and metabolic regulation. The thyroid gland, a butterfly-shaped organ situated in the neck, orchestrates a multitude of bodily functions by producing and releasing thyroid hormones, primarily thyroxine (T4) and triiodothyronine (T3).

These hormones play pivotal roles in regulating metabolism, growth, development, temperature regulation, and energy expenditure, exerting profound effects on virtually every organ system. Hyperthyroidism, characterized by excessive thyroid hormone production and activity, and hypothyroidism, marked by insufficient thyroid hormone levels, represent the two principal manifestations of thyroid dysfunction.

Hyperthyroidism often manifests with symptoms such as palpitations, heat intolerance, weight loss, tremors, and hyperactivity, reflecting the heightened metabolic state induced by elevated thyroid hormone levels. Conversely, hypothyroidism presents with symptoms such as fatigue, weight gain, cold intolerance, dry skin, constipation, and cognitive impairment, reflecting the metabolic slowdown associated with reduced thyroid hormone levels. Left untreated, thyroid disorders can lead to a myriad of complications affecting cardiovascular, musculoskeletal, neurological, and reproductive systems. Cardiovascular manifestations include tachycardia, arrhythmias, hypertension, and increased risk of heart failure, while musculoskeletal complications encompass osteoporosis, muscle weakness, and joint pain. Neurological symptoms such as cognitive impairment, depression, and peripheral neuropathy may also occur, alongside reproductive disturbances, including menstrual irregularities and infertility

## II. CLINICAL MANIFESTATIONS OF HYPERTHYROIDISM

### Symptoms:

- Rapid heartbeat (tachycardia)
- Palpitations
- Heat intolerance
- Excessive sweating
- Tremors
- Weight loss despite increased appetite
- Nervousness, irritability, anxiety
- Difficulty sleeping (insomnia)
- Fatigue and muscle weakness
- Frequent bowel movements or diarrhea
- Menstrual irregularities in women
- Erectile dysfunction in men

### Signs :

- Enlarged thyroid gland (goiter)
- Warm, moist skin
- Fine tremor of the hands or fingers

- Lid lag or stare due to thyroid eye disease (Graves' ophthalmopathy)
- Exophthalmos (bulging eyes)
- Pretibial myxedema (rare, seen in severe cases of Graves' disease)
- High blood pressure
- Cardiac arrhythmias

### III. CLINICAL MANIFESTATIONS OF HYPOTHYROIDISM

#### Symptoms:

- Fatigue and lethargy
- Weight gain or difficulty losing weight
- Cold intolerance
- Dry, coarse skin
- Constipation Hoarseness
- Muscle weakness and cramps
- Joint pain and stiffness
- Depression and impaired memory
- Menstrual irregularities or heavy menstrual periods in women
- Erectile dysfunction or decreased libido in men
- Hair loss, brittle nails
- Puffiness of the face, hands, and feet (myxedema)

#### Signs:

- Enlarged thyroid gland (goiter) in some cases, especially in Hashimoto's thyroiditis
- Dry, cool skin Delayed relaxation phase of deep tendon reflexes (Woltman's sign) Bradycardia (slow heartbeat)
- Slowed speech and movements
- Decreased sweating
- Peripheral edema Coarse, thinning hair

### IV. TREATMENT

#### 1. Thyroid Hormone Replacement Therapy:

##### ❖ LEVOTHYROXINE (T4):

- **Dose:** The usual starting dose for adults with hypothyroidism is 25-50 mcg/day, with adjustments made in increments of 25-50 mcg every 4-6 weeks based on thyroid function tests. Maintenance doses typically range from 75-150 mcg/day.
- **MOA:** Levothyroxine, a synthetic form of thyroxine, is the primary treatment for hypothyroidism. It acts as a prohormone and is converted to triiodothyronine (T3) in peripheral tissues, restoring euthyroidism and alleviating hypothyroid symptoms.
- **Side Effects:** Common side effects include palpitations, tachycardia, anxiety, insomnia, weight loss, heat intolerance, and sweating. In

rare cases, allergic reactions, angina, arrhythmias, and exacerbation of preexisting cardiovascular conditions may occur.

##### ❖ LIOTHYRONINE (T3):

- **Dose:** Liothyronine is less commonly used than levothyroxine due to its shorter half-life. Initial doses range from 5-25 mcg/day, with adjustments based on clinical response and thyroid function tests.

- **Side Effects:** Side effects are similar to those of levothyroxine and may include cardiac arrhythmias, palpitations, sweating, and nervousness.

#### 2. Antithyroid Drugs (Thionamides):

##### ❖ METHIMAZOLE:

- **Dose:** The typical starting dose for hyperthyroidism is 15-30 mg/day, divided into 3 doses. Maintenance doses range from 5-15 mg/day. In Graves' disease, higher initial doses may be used.

- **MOA:** Methimazole inhibits thyroid peroxidase, thereby blocking thyroid hormone synthesis. It is commonly used in the management of hyperthyroidism, including Graves' disease and toxic nodular goiter.

- **Side Effects:** Common side effects include rash, pruritus, arthralgia, gastrointestinal upset, and agranulocytosis (rare but serious). Transient hair loss and hepatotoxicity may also occur.

##### ❖ PROPYLTHIOURACIL (PTU):

- **Dose:** Initial doses range from 100-300 mg/day, divided into 2-3 doses. Maintenance doses range from 50-150 mg/day. PTU is often used in pregnant women due to its lower risk of congenital anomalies.

- **Side Effects:** Side effects are similar to those of methimazole but with a higher risk of hepatotoxicity and agranulocytosis. PTU is associated with a rare but severe hepatotoxicity called PTU-induced liver injury.

#### 3. Iodine-Containing Compounds:

##### ❖ POTASSIUM IODIDE (KI):

- **Dose:** For hyperthyroidism crisis, single doses of 1000-2000 mg may be administered orally. In preparation for thyroidectomy or RAI therapy, KI may be given at lower doses (e.g., 100-300 mg/day).

- **Side Effects:** Side effects include metallic taste, gastrointestinal upset, hypersensitivity reactions, and iodism (iodine toxicity)

symptoms such as sore throat, salivation, and skin rashes.

#### 4. **Beta-Blockers:**

##### ❖ PROPRANOLOL:

- **Dose:** The initial dose for symptomatic relief of hyperthyroidism is 20-40 mg 3-4 times daily. Higher doses may be required in severe cases.
- **Side Effects:** Common side effects include bradycardia, hypotension, fatigue, dizziness, and exacerbation of heart failure. Abrupt withdrawal may precipitate rebound tachycardia and hypertension.

#### 5. **Radioactive Iodine (RAI) Therapy:**

##### ❖ I-131 (SODIUM IODIDE):

- **Dose:** RAI therapy doses are individualized based on thyroid size, uptake, and severity of hyperthyroidism. Typical doses range from 5-15 mCi for Graves' disease and 10-30 mCi for toxic nodular goiter.
- **Side Effects:** Side effects include radiation thyroiditis, transient exacerbation of hyperthyroidism, and the risk of hypothyroidism, necessitating lifelong thyroid hormone replacement therapy.

### V. CONCLUSION:

- With the help of these articles we can conclude that:
- Effective management of hypothyroidism and hyperthyroidism hinges on a tailored approach encompassing pharmacotherapy, radioactive iodine, or surgical intervention.
- The management of hypothyroidism relies on Levothyroxine, the synthetic form of thyroxine, stands as the gold standard for hypothyroidism management, offering excellent efficacy in restoring euthyroidism and alleviating associated symptoms. Its long-term safety profile, predictable pharmacokinetics, and low cost make it a preferred choice for most patients.
- In contrast, the pharmacological landscape for hyperthyroidism encompasses a broader spectrum of agents targeting thyroid hormone synthesis, release, or action.
- Thionamides, including methimazole and propylthiouracil, effectively inhibit thyroid hormone production and represent first-line therapy for most cases of hyperthyroidism. Methimazole when treated with dose below 10mg/dl is safer and effective. Despite their efficacy, thionamides carry a risk of adverse

reactions, including agranulocytosis and hepatotoxicity, necessitating close monitoring during treatment.

- Beta-blockers play a supportive role in managing adrenergic symptoms associated with hyperthyroidism, offering rapid relief of tachycardia and tremors. Additionally, radioactive iodine therapy and surgical interventions provide definitive treatment options for patients with persistent or severe hyperthyroidism, albeit with potential risks of hypothyroidism and surgical complications.
- Ongoing research efforts aim to refine existing therapies and develop innovative solutions to address the evolving landscape of thyroid disorders. This review highlights the importance of individualized treatment plans, close monitoring, and continued research to optimize outcomes in patients with thyroid dysfunction.

### REFERENCES

- [1]. Jonklaas J, Bianco AC, Bauer AJ, et al. Guidelines for the treatment of hypothyroidism: prepared by the American Thyroid Association Task Force on Thyroid Hormone Replacement. *Thyroid*. 2014 Dec;24(12):1670-751. <https://doi.org/10.1089/thy.2014.0028>
- [2]. Garber JR, Cobin RH, Gharib H, et al. Clinical practice guidelines for hypothyroidism in adults: cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association. *Endocr Pract*. 2012 Nov-Dec;18(6):988-1028.
- [3]. Ross DS, Burch HB, Cooper DS, et al. 2016 American Thyroid Association Guidelines for Diagnosis and Management of Hyperthyroidism and Other Causes of Thyrotoxicosis. *Thyroid*. 2016 Oct;26(10):1343-1421.
- [4]. Bahn Chair RS, Burch HB, Cooper DS, et al. Hyperthyroidism and other causes of thyrotoxicosis: management guidelines of the American Thyroid Association and American Association of Clinical Endocrinologists. *Thyroid*. 2011 Jun;21(6):593-646.
- [5]. Brent GA. Clinical practice. Graves' disease. *N Engl J Med*. 2008 Jan 10;358(24):2594-605.
- [6]. Cooper DS. Antithyroid drugs. *N Engl J Med*. 2005 Mar 10;352(9):905-17.



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- [7]. Wartofsky L, Glinoe D, Solomon B, et al. Differences and similarities in the diagnosis and treatment of Graves' disease in Europe, Japan, and the United States. *Thyroid*. 1991;1(2):129-35.
- [8]. Mandel SJ, Larsen PR, Davies TF. Thyrotoxicosis. In: Melmed S, Polonsky KS, Larsen PR, Kronenberg HM, eds. *Williams Textbook of Endocrinology*. 13th ed. Philadelphia, PA: Elsevier; 2016: p. 384-411
- [9]. Laurberg P, Bournaud C, Karmisholt J, et al. Management of Graves' hyperthyroidism is associated with increased pregnancy complications. *Eur J Endocrinol*. 2015 Sep;173(3):337-44
- [10]. Brent GA, Davies TF. Hypothyroidism and Thyroiditis. In: Melmed S, Polonsky KS, Larsen PR, Kronenberg HM, eds. *Williams Textbook of Endocrinology*. 13th ed. Philadelphia, PA: Elsevier; 2016: p. 389-411.