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Hyperthyroidism

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Summary

Hyperthyroidism is a pathological syndrome in which tissue is exposed to excessive amounts of circulating thyroid hormone. The most common cause of this syndrome is Graves' disease, followed by toxic multinodular goitre, and solitary hyperfunctioning nodules. Autoimmune postpartum and subacute thyroiditis, tumors that secrete thyrotropin, and drug-induced thyroid dysfunction, are also important causes.

key words: thyrotoxicosis • hyperthyroidism • Graves' disease • radioactive iodine • antithyroid drugs • thyroidectomy

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BACKGROUND

Thyrotoxicosis is the term applied when there is excess thyroid hormone in the circulation due to any cause. The diagnosis of hyperthyroidism is generally straightforward, with raised serum thyroid hormones and suppressed serum thyroid stimulating hormone (TSH) in almost all cases. Thyrotoxicosis can be easily diagnosed by a high serum level of thyroxine (T4) and triiodothyronine (T3) and a low serum level of TSH. Hyperthyroidism is confirmed by a high isotope (I 131 or Tc99) uptake by the thyroid gland, while in thyroiditis it will be low.

Appropriate treatment of hyperthyroidism relies on identification of the underlying cause. Antithyroid drugs, radioactive iodine, and surgery are the traditional treatments for the 3 common forms of hyperthyroidism. Beta-adrenergic blocking agents are used in most patients for symptomatic relief and might be the only treatment needed for thyroiditis, which is transient. This review outlines approaches to diagnosis, assessment of disease severity, and treatment of hyperthyroidism.

Hyperthyroidism is a clinical situation where there are excess thyroid hormones in the circulation due to increased synthesis of hormone from a hyperactive thyroid gland. Thyrotoxicosis is defined as the state of thyroid hormone excess.

Symptoms of overt hyperthyroidism include heat intolerance, palpitations, anxiety, fatigue, weight loss, muscle weakness, and, in women, irregular menses. Clinical findings may include tremor, tachycardia, lid lag, and warm moist skin [1]. Symptoms and signs of subclinical hyperthyroidism, if present, are usually vague and nonspecific.

CAUSES OF THYROTOXICOSIS

Thyrotoxicosis is defined as the state of thyroid hormone excess and is not synonymous with hyperthyroidism, which is the result of excessive thyroid function. However, the major etiologies of thyrotoxicosis are hyperthyroidism caused by Graves' disease, toxic multinodular goiter, and toxic adenomas. To treat thyrotoxicosis appropriately, determining the cause is essential. The most common causes of thyrotoxicosis are discussed in Table 1.

GRAVES' DISEASE

Graves' disease is an autoimmune disorder in which thyroid stimulating immunoglobulin (TSI) binds to and stimulates the TSH receptor on the thyroid cell membrane, resulting in excessive synthesis and secretion of thyroid hormone [2]. Graves' disease is the most common cause of hyperthyroidism and is frequently complicated by ophthalmopathy, which can be a debilitating component of the disease, resulting in impaired quality of life. The management of Graves' disease aims to restore the patient to a euthyroid state and minimize the extent of extrathyroidal manifestations such as ophthalmopathy. Patients with Graves' disease usually have diffuse, nontender, symmetrical enlargement of the thyroid gland. Ophthalmopathy, consisting of protrusion of the eyes with periorbital soft tissue swelling and inflammation, and inflammatory changes in the extraocular

muscles resulting in diplopia and muscle imbalance, is clinically evident in 30% of patients with Graves' disease [1].

TOXIC NODULAR GOITER

Toxic adenomas are benign monoclonal thyroid tumors that secrete excess thyroid hormone autonomously. Thyrotoxicosis may develop in patients with a single autonomous thyroid nodule or in those with multiple autonomous nodules (toxic multinodular goiter, also known as Plummer's disease). Nodular autonomy typically progresses gradually, leading first to subclinical, and then to overt, hyperthyroidism. Remission is rare. Physical examination shows a single thyroid nodule, usually at least 2.5 cm in size, or a multinodular goiter. Ophthalmopathy and other stigmata of Graves' disease, including antithyroid antibodies, are absent.

THYROIDITIS

Thyroiditis may cause transient thyrotoxicosis, with a characteristic low or undetectable thyroid radioiodine uptake [3]. Painless lymphocytic thyroiditis occurs in up to 10% of women after giving birth [4]. This is an inflammatory autoimmune disorder in which lymphocytic infiltration results in thyroid destruction and leads to transient mild thyrotoxicosis as thyroid hormone stores are released from the damaged thyroid. As the gland becomes depleted of thyroid hormone, progression to hypothyroidism occurs. Thyroid function returns to normal within 12–18 months in 80% of patients.

Painful subacute thyroiditis, the most common cause of thyroid pain, is a self-limiting inflammatory disorder of possible viral etiology. Patients typically present acutely with fever and severe neck pain or swelling, or both. About half will describe symptoms of thyrotoxicosis. After several weeks of thyrotoxicosis, most patients will develop hypothyroidism, similar to postpartum thyroiditis. Thyroid function eventually returns to normal in almost all patients. The hallmark of the laboratory evaluation of painful subacute thyroiditis is a markedly elevated erythrocyte sedimentation rate and C reactive protein.

EXOGENOUS INGESTION OF THYROID HORMONE

Excess exogenous thyroid hormone is often associated with thyrotoxicosis. This may be iatrogenic, either intentional, when TSH suppressive doses of thyroid hormone are prescribed to suppress the growth of thyroid cancer or decrease the size, or unintentional, when overly vigorous treatment with thyroid hormone is prescribed for hypothyroidism. Thyrotoxicosis factitia may also result from patients' surreptitious use of thyroid hormones or from inadvertent ingestion. Serum thyroglobulin values are low to undetectable in thyrotoxicosis factitia but are raised in all other causes of thyrotoxicosis.

DIAGNOSIS OF THYROTOXICOSIS

In all forms of overt thyrotoxicosis, the serum value of TSH is decreased and the measurements of free thyroxine or free tri-iodothyronine, or both, are raised. Subclinical thyrotoxicosis is defined as the presence of a persistently low serum

Table 1. Causes of thyrotoxicosis.

Common causes	Etiology	Diagnostic features
Graves' disease	Thyroid stimulating immunoglobulin (TSI) binds to and stimulates the thyroid	Increased thyroid radioactive iodine uptake with diffuse uptake on scan; positive thyroperoxidase antibodies; raised serum TSI; diffuse goiter; ophthalmopathy may be present
Toxic adenoma	Monoclonal autonomously secreting benign thyroid tumor	Normal to increased thyroid radioactive iodine uptake with all uptake in the nodule on scan; thyroperoxidase antibodies absent
Toxic multinodular goiter	Multiple monoclonal autonomously secreting benign thyroid tumors	Normal to increased thyroid radioactive iodine uptake with focal areas of increased and reduced uptake on scan; thyroperoxidase antibodies absent
Exogenous thyroid hormone (thyrotoxicosis factitia)	Excess exogenous thyroid hormone	Low to undetectable thyroid radioactive iodine uptake; low serum thyroperoxidase values
Painless postpartum lymphocytic thyroiditis	Autoimmune lymphocytic infiltration of thyroid with release of stored thyroid hormone	Low to undetectable thyroid radioactive iodine uptake; thyroperoxidase antibodies present; occurs within six months after pregnancy
Less common causes		
Painless sporadic thyroiditis	Autoimmune lymphocytic infiltration of thyroid with release of stored thyroid hormone	Low to undetectable thyroid radioactive iodine uptake; thyroperoxidase antibodies present
Subacute thyroiditis	Thyroid inflammation with release of stored thyroid hormone; possibly viral	Low to undetectable thyroid radioactive iodine uptake; low titer or absent thyroperoxidase antibodies
Iodine-induced hyperthyroidism	Excess iodine	Low to undetectable thyroid radioactive iodine uptake
Drug-induced thyrotoxicosis (lithium, interferon alfa)	Induction of thyroid autoimmunity (Grave's disease) or inflammatory thyroiditis	Thyroid radioactive iodine uptake elevated in Graves' disease or low to undetectable in thyroiditis
Amiodarone- induced thyrotoxicosis	Iodine-induced hyperthyroidism (type I) or inflammatory thyroiditis (type II)	Low to undetectable thyroid radioactive iodine uptake
Rare causes		
Thyroid stimulating hormone secreting pituitary adenoma	Pituitary adenoma	Raised serum thyroid stimulating hormone with raised peripheral serum thyroid hormones
Gestational thyrotoxicosis	Stimulation of thyroid stimulating hormone receptors by human chorionic gonadotrophin	First trimester, often in setting of hyperemesis or multiple gestation
Molar pregnancy	Stimulation of thyroid stimulating hormone receptors by human chorionic gonadotrophin	Molar pregnancy
Struma ovarii	Ovarian teratoma with differentiation primarily into thyroid cells	Low to undetectable thyroid radioactive iodine uptake (raised uptake of radioactive iodine in pelvis)
Widely metastatic functional follicular thyroid carcinoma	Thyroid hormone production by large tumor masses	Differentiated thyroid carcinoma with bulky metastases; tumour radioactive iodine uptake visible on whole body scan

concentration of TSH, with normal free T3 and T4 concentrations. Once thyrotoxicosis has been identified by laboratory values, the thyroid radioiodine uptake and scan may be used to help distinguish the underlying etiology. Thyroid radioiodine uptake is raised in Graves' disease. It may be

normal or raised in patients with a toxic multinodular goiter. It is very low or undetectable in thyrotoxicosis resulting from exogenous administration of thyroid hormone or from the thyrotoxic phase of thyroiditis. A scan may be helpful in differentiating between Graves' disease (diffuse uptake)

and toxic multinodular goiter (focal areas of increased uptake). The presence of raised serum concentrations of thyroperoxidase antibodies indicates an autoimmune thyroid disorder, and a raised TSI value indicates Graves' disease.

Thyroid carcinoma can be seen in hyperthyroidism, and fine needle aspiration biopsy can be performed to diagnose thyroid malignancy in patients with hyperthyroidism [5]. Among people 60 years of age or older, a low serum thyrotropin concentration is associated with a threefold higher risk that atrial fibrillation will develop in the subsequent decade [6].

TREATMENT OF OVERT THYROTOXICOSIS

Much of the treatment for thyrotoxicosis is based on empirical evidence. To date, relatively few, large-scale, randomized clinical trials have been conducted. Perhaps for this reason, treatment preferences vary substantially.

ANTITHYROID DRUGS

The thionamide drugs propylthiouracil (PTU) and methimazole are available in the United States. Carbimazole, which is available in Europe and Asia, is similar to methimazole, to which it is metabolized [2]. The thionamides decrease thyroid hormone synthesis and will control hyperthyroidism within several weeks in 90% of patients [7]. The thionamides may also decrease serum TSI concentrations in patients with Graves' disease [8]. In addition, large doses of PTU, but not methimazole or carbimazole, decrease the peripheral conversion of T4 to the active hormone T3 [7]. A small, randomized clinical trial has determined that a major advantage of methimazole over PTU is the fact that it may be given once daily, whereas PTU requires multiple daily doses [9].

Thionamides are used in patients with Graves' disease in the hope of inducing a remission. On the basis of the results of 4 randomized clinical trials variously comparing treatment durations of 6, 12, 18, 24, and 42 months, it has been determined that treatment with a thionamide for 12-18 months is optimal, resulting in long term remission in 40-60% of patients with Graves' disease [10]. Aggregate data from several small clinical trials show no clear benefit from using a block-replace regimen (a large dose of a thionamide in combination with thyroid hormone [10]. Because toxic nodular goiter rarely, if ever, goes into remission, thionamides may be used for the short term treatment of patients with toxic nodular goiter to induce euthyroidism before definitive treatment, but are not appropriate for long-term therapy. Thionamides are never appropriate for the treatment of patients with thyroiditis, in whom no excess synthesis of thyroid hormone occurs.

Minor side effect such as fever, rash, urticaria, and arthralgias occur in up to 5% of patients taking thionamides. More severe side effects are relatively rare. The side effects of methimazole and carbimazole, but not PTU, may be dose-related [9].

Agranulocytosis occurs in approximately 0.5% of patients treated with thionamides [11]. Mild rises in transaminase concentrations occur in up to 30% of patients taking PTU, but severe hepatotoxicity has been reported only rarely.

Patients taking methimazole or carbimazole may develop reversible cholestasis or, much more rarely, acute inflammatory hepatitis [12]. Finally, vasculitis positive for antineutrophil cytoplasmic antibodies has been reported as a rare complication of PTU use [13].

Untreated hyperthyroidism during pregnancy increases the risk for fetal and maternal complications. Thionamides cross the placenta in small amounts and may cause fetal hypothyroidism and goiter [14]. Limited evidence therefore shows that treatment with relatively low thionamide doses (just enough to keep the mother's free T4 index in the high-normal to slightly thyrotoxic range) is advisable [15]. Methimazole has been associated with cutis aplasia and with other congenital anomalies such as esophageal and choanal atresia in rare case reports [16]. For this reason, PTU is preferred over methimazole or carbimazole during pregnancy in regions where it is available [7]. Although small amounts of thionamide medications are secreted in breast milk, prospective clinical studies have shown that the use of up to 750 mg/day of PTU or up to 20 mg/day of methimazole in lactating mothers does not affect the infants' thyroid function [17,18].

OTHER DRUGS

In patients with severe hyperthyroidism or in those with thyroiditis (in whom thionamides are inappropriate), adjunctive drugs may be used to alleviate symptoms or restore euthyroidism more rapidly. None of these therapies treat the underlying causes of thyrotoxicosis. Beta blockers relieve symptoms such as tachycardia, tremor, and anxiety in thyrotoxic patients. Beta blockade should be used as the primary treatment only in patients with thyrotoxicosis due to thyroiditis. High-dose glucocorticoids may be used to inhibit conversion of T4 to T3 in patients with thyroid storm (the most severe form of thyrotoxicosis). Glucocorticoids may also be used to relieve severe anterior neck pain and to restore euthyroidism in patients with painful subacute thyroiditis. Inorganic iodide (a saturated solution of potassium iodide or Lugol's solution) decreases the synthesis of thyroid hormone and release of hormone from the thyroid in the short term. It is used to treat patients with thyroid storm or, more commonly, to reduce thyroid vascularity before thyroidectomy. Iopanoic acid, an oral cholecystographic agent rich in iodine, decreases synthesis and release of thyroid hormone and inhibits conversion of T4 to T3.

RADIOACTIVE IODINE

Treatment with ¹³¹I is effective for patients with hyperthyroidism due to Graves' disease or toxic nodular goiter: retrospective data show that 80-90% will become euthyroid within 8 weeks after a single ¹³¹I dose, whereas the remainder will require one or more additional doses [19]. In patients with toxic multinodular goiter, a prospective clinical study has determined that radioactive iodine therapy will reduce goiter size by 40% [20]. ¹³¹I eventually causes permanent hypothyroidism in almost all patients.

Possible side effects of ¹³¹I therapy include mild anterior neck pain caused by radiation thyroiditis or worsened thyrotoxicosis for several days owing to the leakage of preformed thyroid hormones from the damaged thyroid gland. Pretreatment with a thionamide may reduce the risk for worsened thyrotoxicosis after treatment with ¹³¹I.

Graves' ophthalmopathy may develop or worsen after treatment with ^{131}I , especially in smokers and in patients with severe hyperthyroidism [21]. Strong prospective evidence shows that the exacerbation of Graves' ophthalmopathy can be prevented by the simultaneous administration of glucocorticoids [22].

555 megabecquerel (MBq) of radioiodine was no more effective than 370 MBq in managing patients with Graves' disease. We therefore recommend that the higher activity should not be routinely used in these patients [23]. Radioactive iodine therapy is relatively contraindicated in children and adolescents because of the lack of data regarding the long-term risks associated with radiation. Radioactive iodine is absolutely contraindicated during pregnancy and lactation.

Although radioiodine is increasingly the treatment of choice in patients with hyperthyroidism due to Graves' disease, we need to be more cautious about a treatment that almost always causes hypothyroidism, especially when we have no consensus on what constitutes correct thyroid hormone replacement [24]. Some patients abhor the idea of any form of irradiation. In addition, radioiodine, rather than anti-thyroid drugs or surgery, is most closely associated with deterioration in ophthalmopathy, a risk that can be reduced by concomitant treatment with steroids [25]. Patients worry that they will gain excessive weight if rendered hypothyroid, and this may be true if serum concentrations of thyroid stimulating hormone are simply restored to the reference range with thyroxine [26]. After receiving radioisotopes, patients might trigger radiation alarms for up to a varying number of days depending on the radioisotope [27]. Therefore, it would be necessary to inform your patient that airport alarms may be triggered for up to 12 weeks after receiving this therapy.

Young thyroid cancer patients, particularly those with node or lung metastases, who will probably undergo repeated treatments, should be aware of the potential risks to their fertility. An evaluation of testicular function is thus advisable. When an impairment of fertility potential is already present, the option of freezing semen should be considered. Ceccarelli C et al. stated that iodine therapy in hyperthyroidism does not cause a worsening of semen analysis but an amelioration in affected patients [28].

THYROIDECTOMY

A meta-analysis found that thyroidectomy cures hyperthyroidism in more than 90% of cases [29]. In addition, it eliminates compressive symptoms from large toxic multinodular goiters. Unlike radioactive iodine treatment, it is not associated with worsening of Graves' ophthalmopathy. Thyroidectomy is safe in the second trimester of pregnancy. The procedure bears almost no risk of death when carried out by experienced surgeons. However, thyroidectomy is complicated by recurrent laryngeal nerve injury or permanent hypoparathyroidism in 1–2% of patients [1]. Transient hypocalcemia, bleeding, or infection are also potential complications. Surgery results in permanent hypothyroidism in most patients.

Thionamides are used to restore euthyroidism before thyroidectomy to avoid more severe thyrotoxicosis from leakage

of thyroid hormone into the circulation at the time of surgery and to reduce operative and postoperative complications associated with anaesthesia and surgery in thyrotoxic patients. A saturated solution of potassium iodide or Lugol's solution is given for 7 to 10 days before surgery for Graves' disease to decrease thyroid vascularity.

Subtotal thyroidectomy is another treatment option in patient with hyperthyroidism. Toft et al stated that subtotal thyroidectomy in experienced hands guarantees patients the longest existence without taking drugs [30]. Subtotal thyroidectomy is not the treatment of choice because the operation of subtotal thyroidectomy is not clearly defined, and the amount of thyroid tissue left behind varies from medical center to medical center. There is also a small but definite occurrence rate of thyroid cancer in both Graves' disease and toxic multinodular goiter (4% in one series of 100 total thyroidectomies for thyrotoxicosis [31]). In addition, there is a notable rate of both postoperative hyperthyroidism and hypothyroidism after subtotal thyroidectomy [32,33].

Total thyroidectomy is the only appropriate procedure for the surgical management of hyperthyroidism. It guarantees cure, and, although it also guarantees hypothyroidism, thyroxine replacement treatment is far more predictable as the operation is clearly defined. In et al. demonstrated that total thyroidectomy is more cost effective than radioactive iodine or lifelong antithyroid medication in patient with hyperthyroidism [34].

DEFINITION OF SUBCLINICAL HYPERTHYROIDISM

Subclinical hyperthyroidism is defined as a serum TSH concentration below the statistically defined lower limit of the reference range when serum FT_4 and T_3 concentrations are within their reference ranges [35]. Other causes of a low serum TSH must be excluded. Subclinical hyperthyroidism may result from endogenous overproduction of thyroid hormone from administration of thyroid hormone. Among other causes of a low serum TSH concentration with normal concentrations of free T_4 are delayed recovery of the pituitary TSH-producing cells during or after therapy for hyperthyroidism [36], normal pregnancy [37], various nonthyroidal illnesses (euthyroid sick syndrome) [38,39], or the administration of dopamine [40], glucocorticoids [41,42], and possibly dobutamine [43].

Although subnormal serum TSH concentrations are common in a variety of severe nonthyroidal illnesses, undetectable serum TSH concentrations (<0.01 mIU/L) are rare unless patients are receiving concomitant glucocorticoids (usually in high doses) or dopamine. Although patients with pituitary or hypothalamic failure (including anorexia nervosa) frequently have subnormal serum TSH concentrations, the FT_4 is also usually subnormal [34]. When serum free T_4 is in the normal range, it is almost invariably in the lower part of the range in those with non thyroidal illness in contrast to the high normal FT_4 concentration of typical subclinical hyperthyroidism.

CONSEQUENCES OF UNTREATED SUBCLINICAL HYPERTHYROIDISM

Cardiac dysfunction including arrhythmias can be a potential adverse effect of untreated subclinical hyperthyroidism. Exogenous and endogenous subclinical hyperthyroidism

have been reported to increase heart rate, left ventricular mass, and cardiac contractility, to cause left ventricular diastolic dysfunction (delayed relaxation), and to cause atrial arrhythmias [44]. Few studies included stratified analyses for patients whose TSH was in the 0.1 to 0.45 mIU/L range. One study reported increased all-cause mortality (up to 2.2-fold) and cardiovascular mortality (up to 3-fold) in patients older than 60 years with endogenous subclinical hyperthyroidism and serum TSH concentration lower than 0.5 mIU/L [45].

Evidence for an increased risk of atrial fibrillation when the TSH value is lower than 0.1 mIU/L is substantial [6]. A study found a 5.2-fold increased risk of atrial fibrillation in patients with endogenous subclinical hyperthyroidism and a TSH lower than 0.4 mIU/L compared with euthyroid patients [46]. Several studies have assessed the effects of treatment on cardiac function. Successful treatment of endogenous subclinical hyperthyroidism decreased the heart rate and cardiac output and increased the systemic vascular resistance in an unblinded study of 6 patients [45].

One prospective study reported an increased risk of hip and spine fracture in levothyroxine-treated women older than 65 years whose serum TSH was 0.1 mIU/L or lower, but this study did not distinguish between overt and subclinical hyperthyroidism [47]. The risk of fractures was not increased in women with a serum TSH between 0.1 and 0.5 mIU/L when adjustment was made for prior hyperthyroidism. Overt thyrotoxicosis increased the risk of fracture in most [47,48] but not all [49] studies. Prolonged subclinical hyperthyroidism prior to overt hyperthyroidism may contribute to the increased risk of fracture in patients with thyrotoxicosis [48].

EVALUATION OF SUBCLINICAL HYPERTHYROIDISM

If serum TSH is reported to be between 0.1 and 0.45 mIU/L, the measurement should be repeated for confirmation. Measuring FT₄ and either total T₃ or FT₃ levels is recommended to exclude central hypothyroidism or nonthyroidal illness. Clinical circumstances dictate when the retesting should occur. For patients with atrial fibrillation, cardiac diseases, or other serious medical conditions, repeat testing within 2 weeks is prudent. When these factors are absent, repeat testing is recommended within 3 months.

If the repeat serum TSH concentration remains higher than 0.1 but lower than 0.45 mIU/L, with normal FT₄ and T₃ concentrations, and the patient has no signs or symptoms of cardiac disease, atrial fibrillation, or other arrhythmias, retesting should occur at 3- to 12-month intervals, until either serum TSH normalizes or the clinician and patient are confident that the condition is stable. Patients with known nodular thyroid disease may develop overt hyperthyroidism when exposed to excess iodine (for example, radiographic contrast agents) and require special consideration [50].

If serum TSH concentration is lower than 0.1 mIU/L, the panel recommends repeating the measurement, along with an FT₄ and a total T₃ or FT₃, within 4 weeks of the initial measurement. If the patient has signs or symptoms of cardiac disease, atrial fibrillation or other arrhythmia, or medical issues requiring urgent diagnosis and treatment, these

tests should be performed within a shorter interval, especially if there are signs or symptoms of hyperthyroidism.

If the TSH is lower than 0.45 mIU/L, further evaluation to establish the etiology of the low serum TSH is recommended. A radioactive iodine uptake measurement and scan can distinguish between destructive thyroiditis and hyperthyroidism due to Graves' disease or nodular goiter.

RISKS AND BENEFITS OF THERAPY OF SUBCLINICAL HYPERTHYROIDISM

The risks of treatment of subclinical hyperthyroidism with antithyroid drugs are potential allergic reactions and agranulocytosis. Radioactive iodine therapy commonly causes hypothyroidism and may cause exacerbation of hyperthyroidism or Graves eye disease [51].

There is insufficient evidence to establish a clear association between subclinical hyperthyroidism and adverse clinical outcomes, including atrial fibrillation. However, because of a possible association with increased cardiovascular mortality [44], clinicians might consider treatment of elderly patients with subclinical hyperthyroidism despite the absence of supportive data from intervention trials.

Subclinical hyperthyroidism with a serum TSH level lower than 0.1 mIU/L due to destructive thyroiditis (including postviral subacute thyroiditis and postpartum thyroiditis) resolves spontaneously. Treatment, apart from symptomatic therapy (for example, beta-blockers), is usually not required.

Treatment should be considered for patients who are older than 60 years and for those with or at increased risk for heart disease, osteopenia, or osteoporosis (including estrogen-deficient women), or for those with symptoms suggestive of hyperthyroidism. Younger patients with subclinical hyperthyroidism and serum TSH persistently (months) lower than 0.1 mIU/L may be offered therapy or follow-up depending on individual considerations.

IS SCREENING FOR SUBCLINICAL THYROID DISEASE WARRANTED ?

Population-based screening for thyroid disease is not recommended. Case ascertainment in certain high-risk groups is encouraged. There is insufficient evidence to recommend for or against routine determination of TSH levels (screening) in pregnant women or women planning to become pregnant. It is reasonable to consider serum TSH measurement for women with a family history of thyroid disease, prior thyroid dysfunction, symptoms or physical findings suggestive of hypothyroidism or hyperthyroidism, an abnormal thyroid gland on examination, type 1 diabetes mellitus, or a personal history of an autoimmune disorder.

Disclosure

The authors disclose that they do not have a significant financial interest or other relationship with any product manufacturer or provider of services discussed in this article. The authors do not discuss the use of off-label products, which includes unlabeled, unapproved, or investigational products or devices.

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