

Thyroid Function Tests

Introduction

The first line thyroid function test (TFT) is TSH. If this is normal, no further thyroid tests are required. If the TSH is outside the reference limits, but $<20\text{mU/L}$, the laboratory will automatically measure free T4 (fT4). If the TSH is $>20\text{mU/L}$ no further thyroid tests are necessary. Free T3 (fT3) will be measured if the request form indicates that the patient is taking carbimazole or propylthiouracil and at the discretion of the senior biochemistry staff.

Subclinical Hypothyroidism

TSH concentration above the reference range but $<10\text{mU/L}$ with a normal fT4; TFTs should be repeated in 3-6 months to exclude transient causes of TSH elevation. If the abnormality persists, then serum thyroid peroxidase antibodies should be measured. If the serum antibody concentration is high, then serum TSH should be measured annually or earlier if symptoms develop; thyroxine replacement should be started if the serum TSH concentration rises $>10\text{mU/L}$. If the serum antibody concentration is not raised, then repeat measurement of serum TSH every three years is all that is required. There is no evidence to support routine early treatment with thyroxine in non-pregnant patients with a serum TSH above the reference range but $<10\text{mU/L}$, although thyroxine therapy may be indicated in women seeking pregnancy or in patients with a goitre. Physicians may wish to consider the suitability of a therapeutic trial of thyroxine on an individual patient basis.

Borderline Hypothyroidism

Most patients usually benefit from replacement therapy. However, unless the patient has well developed symptoms, repeat the TFT's at 3 months and then start thyroxine if the TFTs are similar or deteriorating.

Primary Hypothyroidism

A fT4 below the reference range and TSH $>10\text{mU/L}$; these patients should be commenced on treatment.

Secondary Hypothyroidism

A low fT4 with a low/normal TSH; these patients require further pituitary function investigation under an endocrinologist. Tests of adrenal function are mandatory in patients with a high index of suspicion of hypopituitarism. Secondary hypothyroidism can be distinguished from non-thyroidal illness on the basis of clinical history, measurement of fT3 and tests of other anterior pituitary hormones (prolactin, FSH, LH and cortisol).

Subclinical Hyperthyroidism

Some patients who are clinically euthyroid may have a suppressed TSH and normal fT4 and fT3. These patients usually do not require treatment but should be monitored since thyroid disease may develop. The risk of atrial fibrillation and osteoporosis is increased in this group, although there is no consensus on how this should be managed. TFT's should be repeated 3 monthly for 6 months, 6 monthly for 12 months and then annually. If the clinical or biochemical pattern changes, more frequent monitoring may be required.

Primary Hyperthyroidism/Thyrotoxicosis

Elevated fT4 and/or fT3 with suppressed TSH; these patients should be referred for specialist care in order to establish the diagnosis and optimal management plan. The degree of elevation of serum fT4 and fT3 provides an indication of the severity and should be interpreted in the context of clinical symptoms and signs to direct first-line therapy.

Secondary Hyperthyroidism

Elevated fT4 and/or fT3 with an inappropriate/elevated TSH (extremely rare); if confirmed these patients require further pituitary function investigation. Common explanations are binding protein abnormalities leading to apparent elevation of fT4 or antibody interference in the analytical methods (assay dependent). If such explanations have been excluded, then the cause of the inappropriate TSH should be investigated. The major possibilities are TSH-oma or a syndrome of thyroid hormone resistance. The measurement of serum SHBG, alpha-subunit or other anterior pituitary hormones can help distinguish TSH-oma from thyroid hormone resistance.

For sample requirements and reference ranges please see the online test directory. For information regarding monitoring treatment, please see the separate summary guide.

References: UK guidelines for the use of thyroid function tests, British Thyroid Association, July 2006.