

# Hypothyroidism

## Hypothyroidism

### Symptoms

### Signs

#### Common

Weight gain  
Cold intolerance  
Fatigue, somnolence  
Dry skin  
Dry hair  
Menorrhagia

Weight gain

#### Less Common

Constipation  
Hoarseness  
Carpal tunnel syndrome  
Alopecia  
Aches and pains  
Muscle stiffness  
Deafness  
Depression  
Infertility

Hoarse voice  
Facial features:  
    Purplish lips  
    Malar flush  
    Periorbital oedema  
Loss of lateral eyebrows  
Anaemia  
Carotenaemia  
Erythema ab igne  
Bradycardia hypertension  
Delayed relaxation of reflexes  
Dermal myxoedema

#### Rare

Psychosis (myxoedema madness)  
Galactorrhoea  
Impotence

Ileus, ascites  
Pericardial and pleural effusions  
Cerebellar ataxia  
Myotonia

# Common

Weight gain

Cold intolerance

Lethargy, sleepiness

Dry skin, dry hair

Menorrhagia

# Less common

Constipation

Hoarseness of voice

Aches and pains

Muscle stiffness

Carpal tunnel syndrome

Infertility

Periorbital oedema

Alopecia

Loss of lateral eyebrows

Anaemia

Carotenaemia

Bradycardia, Hypertension

Delayed relaxation of reflexes

Deafness

Depression

# Rare

Psychosis (myxoedema madness)

Galactorrhoea

Impotence

Ileus

Ascites, pericardial and pleural effusions

Cerebellar ataxia

Myotonia

# Aetiology

Autoimmune

Iatrogenic

Thyroiditis

Iodine deficiency\*

Congenital\*

Infiltrative

Secondary hypothyroidism\*

## **Autoimmune**

Hashimoto's thyroiditis

Spontaneous atrophic hypothyroidism

Graves' disease with TSH receptor blocking antibodies

## **Iatrogenic**

Radioactive iodine ablation

Thyroidectomy

Drugs:

Carbimazole, methimazole, propylthiouracil

Amiodarone

Lithium

# Thyroiditis

Transient thyroiditis

Subacute (de Quervain's) thyroiditis

Post-partum thyroiditis

Riedel's thyroiditis,

## **Iodine deficiency**

e.g. In mountainous regions

## **Congenital**

Dyshormonogenesis

Thyroid aplasia

## **Infiltrative**

Amyloidosis, Sarcoidosis

## **Secondary hypothyroidism**

Pituitary or hypothalamic disease

| Causes                                                | Anti-TPO antibodies <sup>1</sup> | Goitre <sup>2</sup> |
|-------------------------------------------------------|----------------------------------|---------------------|
| <b>Autoimmune</b>                                     |                                  |                     |
| Hashimoto's thyroiditis                               | ++                               | ±                   |
| Spontaneous atrophic hypothyroidism                   | —                                | —                   |
| Graves' disease with TSH receptor-blocking antibodies | +                                | ±                   |
| <b>Iatrogenic</b>                                     |                                  |                     |
| Radioactive iodine ablation                           | +                                | ±                   |
| Thyroidectomy                                         | +                                | —                   |
| Drugs                                                 |                                  |                     |
| Carbimazole, methimazole, propylthiouracil            | +                                | ±                   |
| Amiodarone                                            | +                                | ±                   |
| Lithium                                               | —                                | ±                   |
| <b>Transient thyroiditis</b>                          |                                  |                     |
| Subacute (de Quervain's) thyroiditis                  | +                                | ±                   |
| Post-partum thyroiditis                               | +                                | ±                   |
| <b>Iodine deficiency</b>                              |                                  |                     |
| e.g. In mountainous regions                           | —                                | ++                  |
| <b>Congenital</b>                                     |                                  |                     |
| Dyshormonogenesis                                     | —                                | ++                  |
| Thyroid aplasia                                       | —                                | —                   |
| <b>Infiltrative</b>                                   |                                  |                     |
| Amyloidosis, Riedel's thyroiditis, sarcoidosis etc.   | +                                | ++                  |
| <b>Secondary hypothyroidism</b>                       |                                  |                     |
| TSH deficiency                                        | —                                | —                   |

# Goitre

## **Prominent goitre**

Iodine deficiency

Dysharmonogenesis

Infiltrative disease

## **Absent goitre**

Thyroidectomy

Thyroid aplasia

Spontaneous atrophic hypothyroidism

Secondary hypothyroidism

# TPO

++ (high titre)

Hashimoto's

+ ( higher probability compared to normal persons)

Other thyroiditis, Iatrogenic, Infiltrative diseases

-

Spontaneous atrophic

Lithium

Iodine deficiency

Congenital

Secondary hypothyroidism

|                                      | <b>TPO</b>    | <b>TG</b>     | <b>TRAb</b>  |
|--------------------------------------|---------------|---------------|--------------|
| <b>Normal population</b>             | <b>8–27</b>   | <b>5–20</b>   | <b>0</b>     |
| <b>Graves' disease</b>               | <b>50–80</b>  | <b>50–70</b>  | <b>80–95</b> |
| <b>Autoimmune<br/>hypothyroidism</b> | <b>90–100</b> | <b>80–90</b>  | <b>10–20</b> |
| <b>Multinodular goitre</b>           | <b>~30–40</b> | <b>~30–40</b> | <b>0</b>     |
| <b>Transient thyroiditis</b>         | <b>~30–40</b> | <b>~30–40</b> | <b>0</b>     |

# Approach to hypothyroidism

Non-thyroidal illness

Secondary hypothyroidism, if TSH  $< 20$

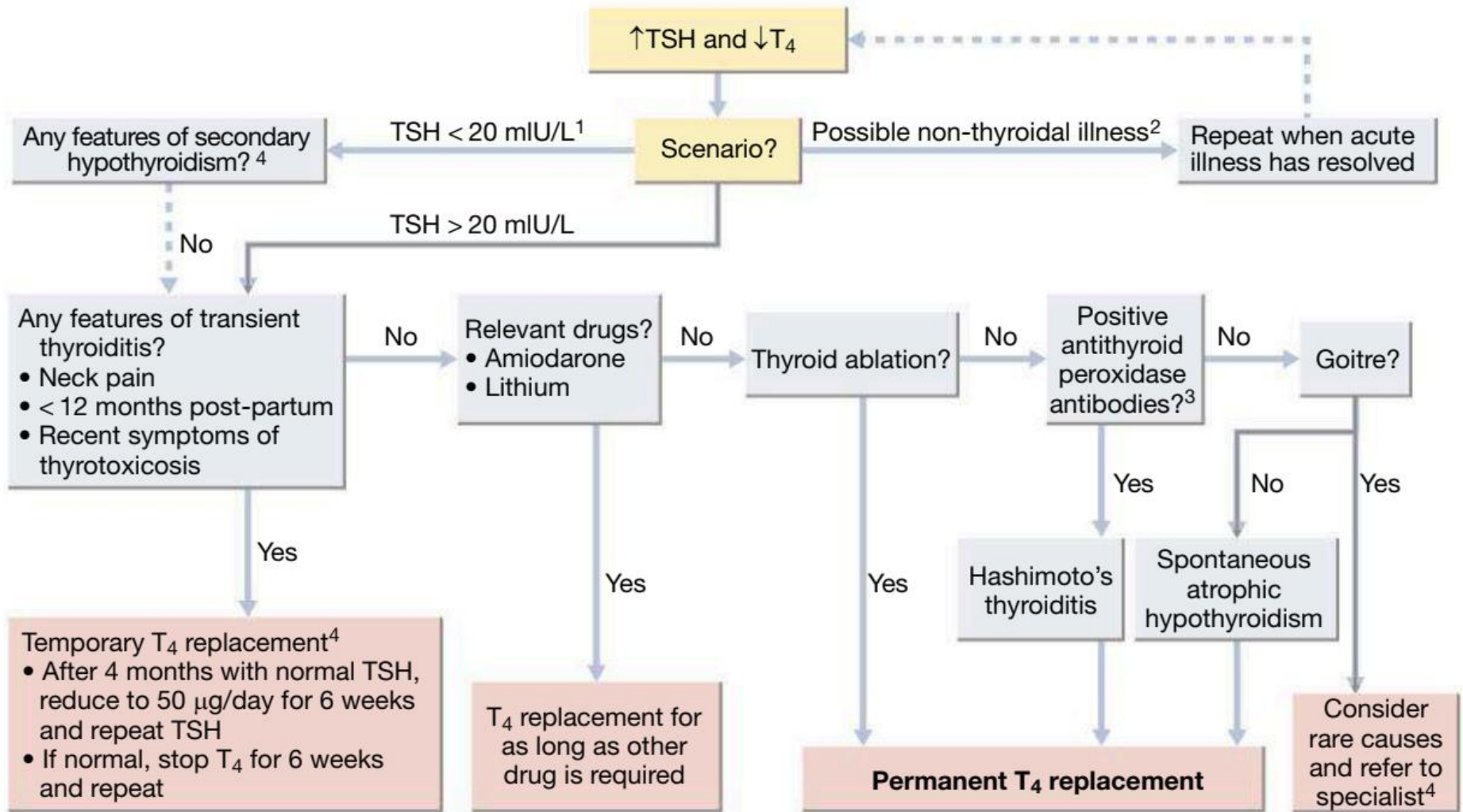
Temporary hypothyroidism

thyroiditis, within 6 months of radioiodine, surgery

Drug induced

TPO antibodies

No goitre vs goitre



# Subclinical hypothyroidism

Biochemical diagnosis

TSH elevated

Normal T3 and T4

When to treat ?

- Non-specific symptoms

- Anti TPO positive

- TSH above 10

# Treatment

T4: half-life of one week, once daily

50 microgram for first 3 weeks

100 microgram after that

Start at 100 microgram in young individuals

1.6 microgram per kg is the usual dose

Repeat TSH after 6 weeks

T3 in myxoedema coma

## **IHD**

25 microgram or less per day in IHD

## **Pregnancy**

Subfertility

Ensure adherence in those with known hypothyroidism

Test as soon as possible

Check in each trimester

Use trimester specific cut off for TSH

Symptoms may be attributed to pregnancy

|                                      | <b>TPO</b>    | <b>TG</b>     | <b>TRAb</b>  |
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| <b>Transient thyroiditis</b>         | <b>~30–40</b> | <b>~30–40</b> | <b>0</b>     |

# Increase dose of T4

## Use of other medication

- Increase T4 clearance: phenobarbital, phenytoin, carbamazepine, rifampicin, sertraline\*, chloroquine\*
- Interfere with intestinal T4 absorption: cholestyramine, sucralfate, aluminium hydroxide, ferrous sulphate, dietary fibre supplements, calcium carbonate

Pregnancy or oestrogen therapy

- Increases concentration of serum thyroxine-binding globulin

After surgical or  $^{131}\text{I}$  ablation of Graves' disease

- Reduces thyroidal secretion with time

Malabsorption

# Decrease dose of T4

## Ageing

- Decreases T4 clearance

Graves' disease developing in patient with long-standing primary hypothyroidism

# **Iodine-induced thyroid dysfunction**

## **Iodine induced thyroid suppression**

Wolff–Chaikoff effect, very high dose of iodine

Lasts for about 10 days, followed by escape

Thyroid storm

Preoperative preparation

## **Iodine induced hypothyroidism**

Increased susceptibility to iodine induced inhibition in those with Hashimoto, treated Grave etc

## **Iodine induced thyrotoxicosis**

Unmasking of subclinical Graves or nodular goitre

# Amiodarone

Structure resembles T4

Huge amount of iodine, 200 mg dose contains 75 mg iodine.

Cytotoxic effect on thyroid follicular cells

Inhibits conversion of T4 to T3

Most patients receiving amiodarone have normal thyroid function but up to 20% develop hypothyroidism or thyrotoxicosis

TSH provides the best indicator of thyroid function.

- *type I*: iodine-induced excess thyroid hormone synthesis  
Jod–Basedow effect
- *type II*: thyroiditis due to a direct cytotoxic effect

# Non-thyroidal illness ('sick euthyroidism')

This typically presents with a low serum TSH, raised T4 and normal or low T3 in a patient with systemic illness

Decreased peripheral conversion of T4 to T3 (with conversion instead to reverse T3)

Altered levels of binding proteins and their affinity for thyroid hormones,

Reduced secretion of TSH.

During convalescence, serum TSH concentrations may increase

Avoid performing thyroid function tests unless there is clinical evidence of concomitant thyroid disease.

# Thyroiditis

Hashimoto's thyroiditis

Lymphocyte infiltration

Goitre followed by atrophy

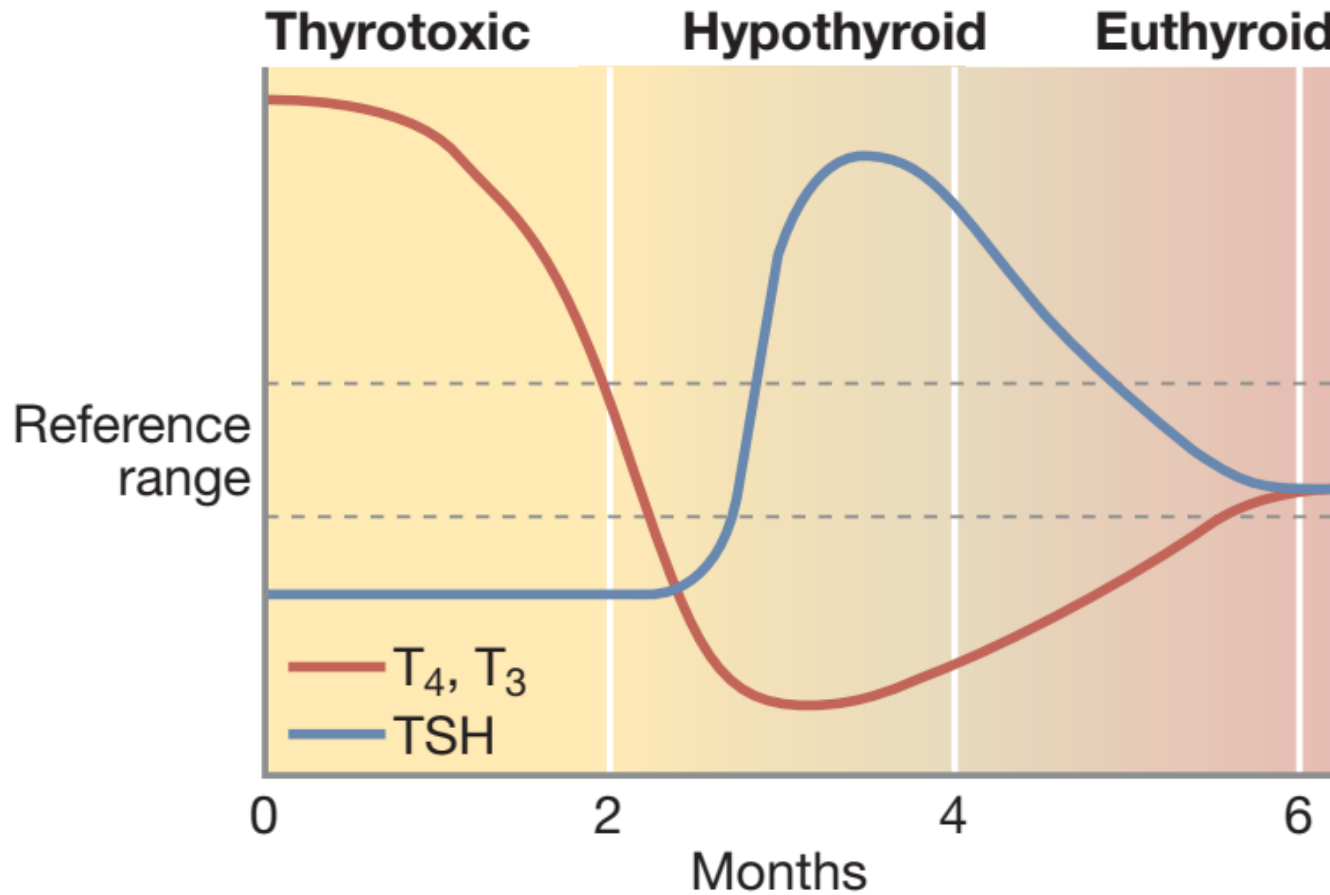
Anti TPO antibodies in > 90%

At risk of hypothyroidism

Euthyroid or hypothyroid

Hashitoxicosis is rare

# Transient thyroiditis



Triphasic illness

Thyrotoxicosis lasting 4 to 6 weeks

Then hypothyroidism, variable severity

Then euthyroid (within 4 to 6 months)

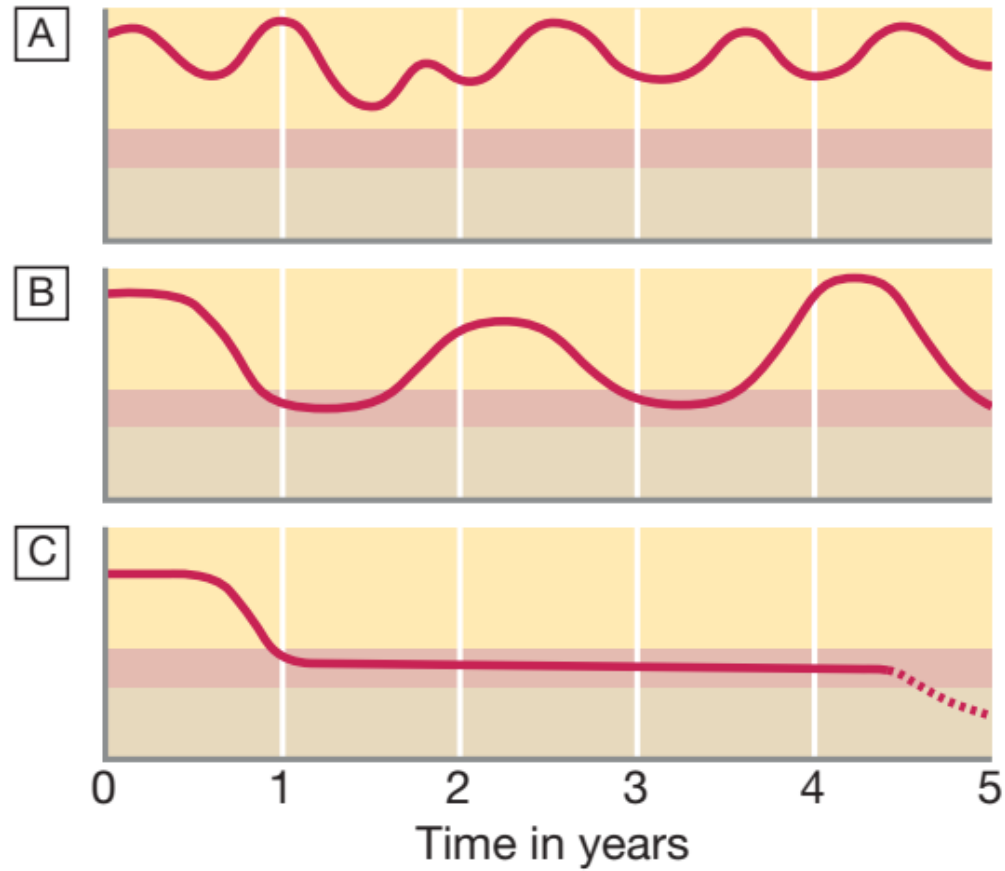
Subacute thyroiditis or de Quervain's thyroiditis

Painful thyroiditis

Painless thyroiditis

Postpartum thyroiditis

# Natural history of Graves



| <b>TSH</b>                                  | <b>Free T4</b> | <b>Free T3</b>       |
|---------------------------------------------|----------------|----------------------|
| <b>U.D.</b>                                 | <b>Raised</b>  | <b>Raised</b>        |
| <b>U.D. or low</b>                          | <b>Raised</b>  | <b>Normal</b>        |
| <b>U.D.</b>                                 | <b>Normal</b>  | <b>Raised</b>        |
| <b>U.D.</b>                                 | <b>Normal</b>  | <b>Normal</b>        |
| <b>U.D. or low</b>                          | <b>Raised</b>  | <b>Low or normal</b> |
| <b>U.D.</b>                                 | <b>Low</b>     | <b>Low</b>           |
| <b>Normal</b>                               | <b>Low</b>     | <b>Low</b>           |
| <b>Mildly elevated</b><br><b>5–20 mIU/L</b> | <b>Low</b>     | <b>Low</b>           |
| <b>Elevated &gt;20 mIU/L</b>                | <b>Low</b>     | <b>Low</b>           |
| <b>Mildly elevated</b><br><b>5–20 mIU/L</b> | <b>Normal</b>  | <b>Normal</b>        |
| <b>Elevated</b>                             | <b>Raised</b>  | <b>Raised</b>        |

| <b>TSH</b>                            | <b>Free T4</b> | <b>Free T3</b>       |                                                                                                                                        |
|---------------------------------------|----------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>U.D.</b>                           | <b>Raised</b>  | <b>Raised</b>        | <b>Primary thyrotoxicosis</b>                                                                                                          |
| <b>U.D. or low</b>                    | <b>Raised</b>  | <b>Normal</b>        | <b>Over-treatment of hypothyroidism with levothyroxine, Factitious thyrotoxicosis</b>                                                  |
| <b>U.D.</b>                           | <b>Normal</b>  | <b>Raised</b>        | <b>Primary T3 toxicosis</b>                                                                                                            |
| <b>U.D.</b>                           | <b>Normal</b>  | <b>Normal</b>        | <b>Subclinical thyrotoxicosis</b>                                                                                                      |
| <b>U.D. or low</b>                    | <b>Raised</b>  | <b>Low or normal</b> | <b>Non-thyroidal illness, Amiodarone therapy</b>                                                                                       |
| <b>U.D.</b>                           | <b>Low</b>     | <b>Low</b>           | <b>Secondary hypothyroidism<sup>4</sup><br/>Transient thyroiditis in evolution</b>                                                     |
| <b>Normal</b>                         | <b>Low</b>     | <b>Low</b>           | <b>Secondary hypothyroidism<sup>4</sup></b>                                                                                            |
| <b>Mildly elevated<br/>5–20 mIU/L</b> | <b>Low</b>     | <b>Low</b>           | <b>Primary hypothyroidism<br/>Secondary hypothyroidism</b>                                                                             |
| <b>Elevated &gt;20 mIU/L</b>          | <b>Low</b>     | <b>Low</b>           | <b>Primary hypothyroidism</b>                                                                                                          |
| <b>Mildly elevated<br/>5–20 mIU/L</b> | <b>Normal</b>  | <b>Normal</b>        | <b>Subclinical hypothyroidism</b>                                                                                                      |
| <b>Elevated</b>                       | <b>Raised</b>  | <b>Raised</b>        | <b>Non-adherence to levothyroxine replacement<br/>– recent ‘loading’ dose<br/>Secondary thyrotoxicosis, Thyroid hormone resistance</b> |

# Myxoedema coma

Very rare presentation

Depressed level of consciousness, usually in an elderly patient

The patient appears myxoedematous.

Body temperature may be as low as 25°C,

Convulsions are not uncommon

Cerebrospinal fluid (CSF) pressure and protein content are raised.

Mortality rate is 50% and survival depends on early recognition and treatment

Other factors contributing to the altered consciousness level such as medication

Cardiac failure, pneumonia, sepsis, dilutional hyponatraemia and respiratory failure.

Myxoedema coma is a medical emergency

20 µg liothyronine/T3 IV stat and 3 times daily until there is sustained clinical improvement.

Hypothalamic or pituitary disease should be considered

Hydrocortisone 100 mg IM 3 times daily

Other measures include slow rewarming, cautious use of intravenous fluids

There is a rise in body temperature within 24 hours  
and

After 48–72 hours, it is usually possible to switch  
patients to oral levothyroxine in a dose of 50  $\mu\text{g}$  daily.