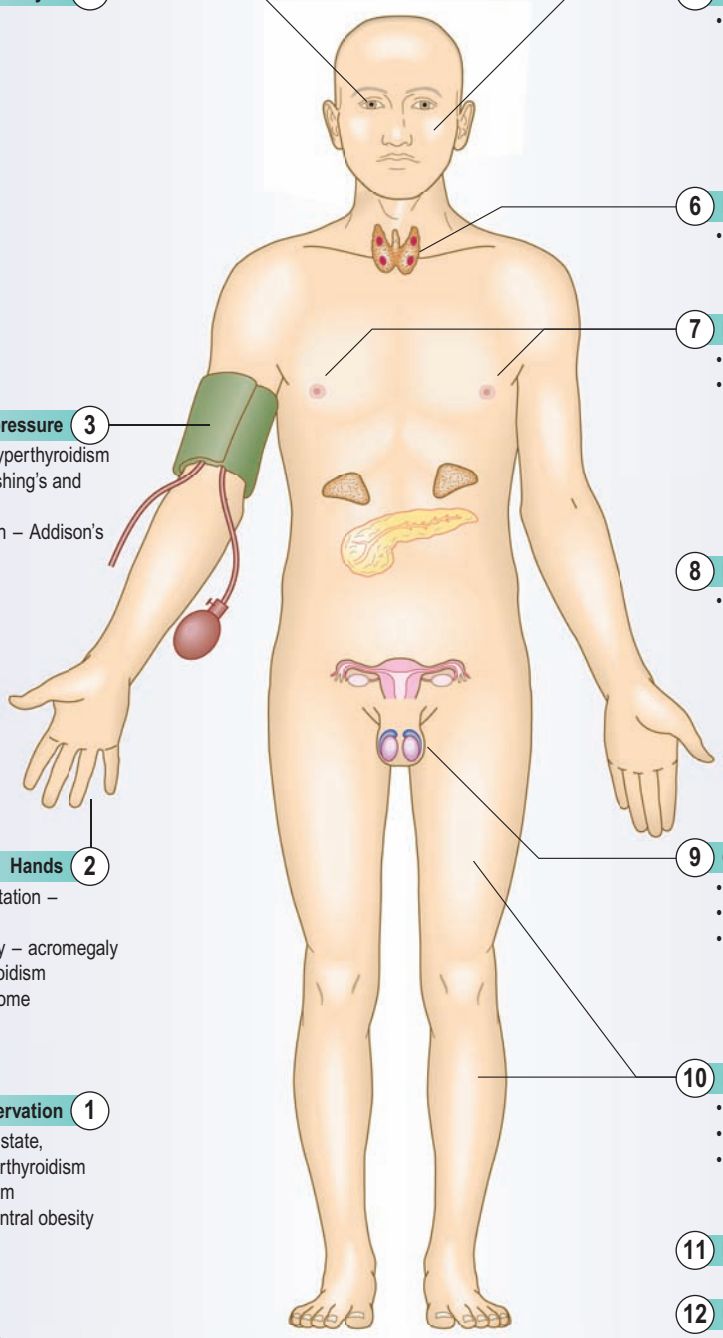
John S. Bevan

The endocrine system

5

ENDOCRINE EXAMINATION



1 General observation
- Demeanour, mental state, e.g. agitated – hyperthyroidism slow – hypothyroidism
- Appearance, e.g. central obesity in Cushing's
- Pallor
- Hair distribution, e.g. absent axillary, pubic – hypopituitarism
- Vitiligo
- Hirsutism

2 Hands
- Skin crease pigmentation – Addison's disease
- Large, sweaty, fleshy – acromegaly
- Tremor – hyperthyroidism
- Carpal tunnel syndrome
- Palmar erythema

3 Pulse and blood pressure
- Tachycardia/AF – hyperthyroidism
- Hypertension – Cushing's and Conn's syndromes
- Postural hypotension – Addison's disease

4 Eyes
- Exophthalmos
- Ophthalmoplegia
- Visual field defect

5 Face
- Features of
  Cushing's syndrome
  Addison's disease
  Acromegaly

6 Neck
- Goitre – smooth/nodular

7 Breasts
- Gynaecomastia
- Galactorrhoea

8 Bones
- Osteoporosis in hyperthyroidism, Cushing's syndrome and hypogonadism

9 Genitalia
- Virilization
- Pubertal development
- Testicular volume

10 Legs
- Proximal myopathy
- Pretibial myxoedema
- Necrobiosis lipodica

11 Height, weight, BMI

12 Urinalysis

13 Psychological/psychiatric assessment

ANATOMY

The main endocrine glands are the pituitary, thyroid, parathyroids, pancreas, adrenals and gonads: testes and ovaries (Fig. 5.1). These glands synthesize hormones which are released into the circulation and act at distant sites. Although some endocrine glands, e.g. parathyroid glands and pancreas, respond directly to metabolic signals, most are controlled by hormones released from the pituitary gland. A wide variety of molecules act as hormones:

- peptides, e.g. insulin
- glycoproteins, e.g. thyroid-stimulating hormone (TSH)
- amines, e.g. noradrenaline (norepinephrine)
- steroid hormones, e.g. cortisol
- oestrogen
- triiodothyronine
- vitamin D.

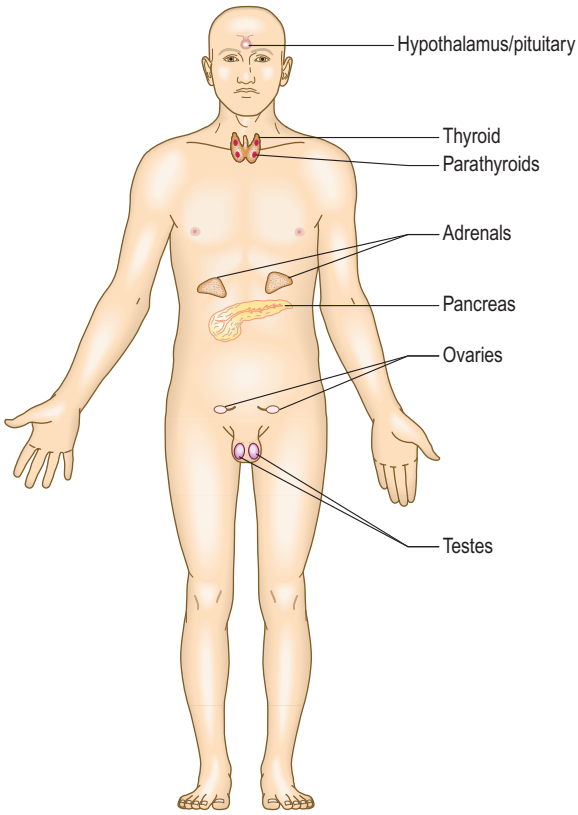


Fig. 5.1 The principal endocrine glands.

THE PHYSICAL EXAMINATION

Symptoms of endocrine disturbance are frequently varied and non-specific, and affect many body systems (Box 5.1). Endocrine conditions may be picked up by chance: for example, hypothyroidism discovered on blood test screening, goitre found during routine medical examination or acromegaly recognized when

5.1 Common clinical features in endocrine disease

Symptom, sign or problem	Differential diagnoses
Weight gain	Hypothyroidism, polycystic ovary syndrome (PCOS), Cushing's syndrome
Weight loss	Hyperthyroidism, diabetes mellitus, adrenal insufficiency
Short stature	Constitutional, non-endocrine systemic disease, e.g. coeliac disease, growth hormone deficiency
Delayed puberty	Constitutional, non-endocrine systemic disease, hypothyroidism, hypopituitarism, primary gonadal failure
Menstrual disturbance	PCOS, hyperprolactinaemia, thyroid dysfunction
Diffuse neck swelling	Simple goitre, Graves' disease, Hashimoto's thyroiditis
Excessive thirst	Diabetes mellitus or insipidus, hyperparathyroidism, Conn's syndrome
Hirsutism	Idiopathic, PCOS, Cushing's syndrome, congenital adrenal hyperplasia
'Funny turns'	Hypoglycaemia, phaeochromocytoma, neuroendocrine tumour
Sweating	Hyperthyroidism, hypogonadism, acromegaly, phaeochromocytoma
Flushing	Hypogonadism (especially menopause), carcinoid syndrome
Resistant hypertension	Conn's syndrome, Cushing's syndrome, phaeochromocytoma, acromegaly, renal artery stenosis
Erectile dysfunction	Primary or secondary hypogonadism, diabetes mellitus, non-endocrine systemic disease
Muscle weakness	Cushing's syndrome, hyperthyroidism, hyperparathyroidism, osteomalacia
Bone fragility and fractures	Cushing's syndrome, hypogonadism, hyperthyroidism
Altered facial appearance	Hypothyroidism, Cushing's syndrome, acromegaly, PCOS

5.2 Prevalence and incidence of endocrine conditions

Condition	Incidence/prevalence
Common	
Type 2 diabetes mellitus	4–8% prevalence (increasing with obesity)
Primary hypothyroidism	2% prevalence (5% including subclinical disease); mostly women
PCOS	6–8% prevalence, depending on definition
Moderately common	
Hyperthyroidism	1% prevalence (80% Graves' disease, 80% in women)
Type 1 diabetes mellitus	0.5% prevalence (increasing in children)
Male hypogonadism	1–2% prevalence, depending on definition
Uncommon	
Hypopituitarism	Prevalence: 50–100 per million
Addison's disease	Prevalence: 50 per million (Western countries, mostly autoimmune)
Differentiated thyroid cancer	Incidence: 5 new cases per 100 000 per year
Rare	
Carcinoid tumour	Incidence: 20 new cases per million per year
Pituitary-dependent Cushing's disease	Incidence: 5 new cases per million per year
Acromegaly	Incidence: 4 new cases per million per year

the doctor meets a patient not seen for several years. Remember that, apart from diabetes mellitus, thyroid disease and some reproductive disorders, endocrine diseases are uncommon; most patients with tiredness or excessive sweating, for example, will not have an underlying endocrine cause (Box 5.2).

Examination sequence

Endocrine disease

- Take time at the outset to make some general observations.
- The initial handshake may suggest a diagnosis.
- Inspect the face for a 'spot' endocrine diagnosis (Figs 5.5A, 5.6A, 5.9A, 5.10A, 5.11A and 5.12A).
- Is the patient restless and agitated (hyperthyroidism) or slow and lethargic (hypothyroidism)?
- Examine the entire skin surface, looking for abnormal pallor (hypopituitarism), vitiligo, plethora (Cushing's or carcinoid syndrome) or pigmentation (Addison's disease).
- If the patient is obese, is the adiposity centrally distributed (Cushing's syndrome and growth hormone deficiency)?
- Is the body hair normal in quality and amount? Look for hirsutism in females with menstrual disturbance, especially on the face, chest and abdomen (polycystic ovary syndrome (PCOS)) (Fig. 5.14).
- Examine the hands for excessive sweating, soft tissue overgrowth (acromegaly), skin crease pigmentation (Addison's disease) and wasting of the thenar muscles due to carpal tunnel syndrome (hypothyroidism, acromegaly) (Fig. 14.32, p. 379). Patients with Cushing's syndrome often have thin, fragile skin (Fig. 5.11D).
- Assess the pulse rate, rhythm and volume. Tachycardia and atrial fibrillation may suggest thyrotoxicosis.
- Record the blood pressure. Hypertension is a feature of several endocrine conditions, such as phaeochromocytoma and Conn's syndrome (primary hyperaldosteronism) (Box 5.1). Check for postural hypotension with lying and standing blood pressures if you suspect adrenal insufficiency.
- Examine the eyes in all thyroid patients for external inflammation, proptosis, diplopia and visual function. Assess visual acuities and fields in patients with suspected pituitary tumours, to detect bitemporal hemianopia due to compression of the optic chiasm. Examine the fundi for optic atrophy in patients with longstanding optic pathway compression (Fig. 12.32, p. 326).
- Examine the neck for goitre. If this is present, record its size, surface and consistency.
- Look for gynaecomastia in men (common in Klinefelter's syndrome 47XXY (Fig. 5.13), and for evidence of milk production in a man or non-breastfeeding woman (galactorrhoea). If you suspect galactorrhoea, gently massage the breast tissue in the direction of the nipple to see if milk is expressed. Explain beforehand why you are performing this examination and watch the patient carefully since this may be uncomfortable.
- Inspect the axillae for acanthosis nigricans (Fig. 5.8A) or loss of axillary hair (Fig. 5.10B).
- Look for a thoracic kyphosis, which may be a sign of osteoporotic vertebral collapse.
- Examine the abdomen. Patients with carcinoid syndrome frequently have a palpable, nodular liver, which is sometimes massively enlarged. Adrenal tumours may occasionally be palpable, but be cautious if phaeochromocytoma is suspected, as over-enthusiastic examination may precipitate a hypertensive paroxysm.
- Examine the male external genitalia (p. 263). Inspect the amount of pubic hair and make a pubertal staging of all adolescents using Tanner gradings. Record testicular consistency and volume (use an orchidometer; Fig. 15.26, p. 424).
- Inspect the legs for evidence of pretibial myxoedema (Graves' disease; Fig. 5.5D), proximal muscle wasting and weakness (Cushing's syndrome and hyperthyroidism).

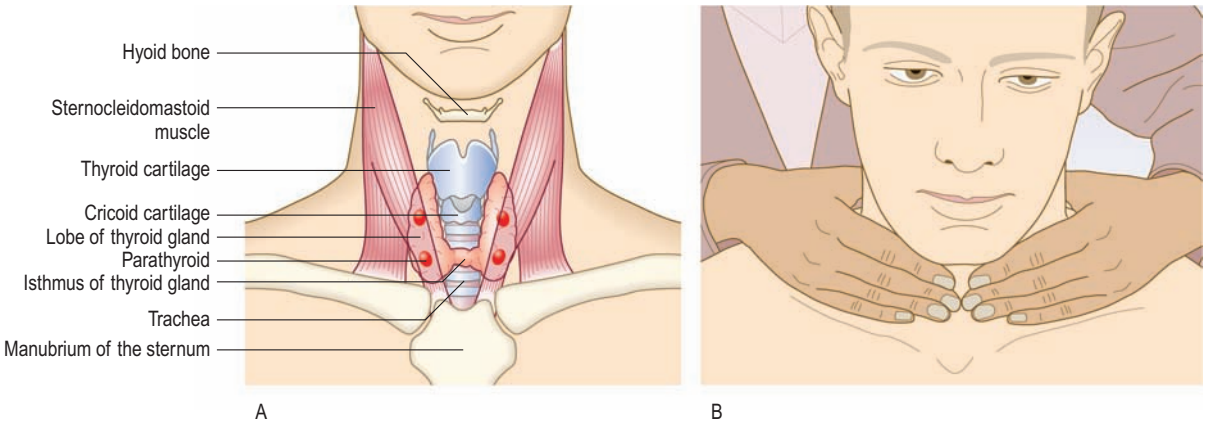


Fig. 5.2 The thyroid gland. (A) Anatomy of the gland and surrounding structures. **(B)** Palpating the thyroid gland from behind.

- Measure the patient's height, using a stadiometer in children and adolescents (Fig. 15.23, p. 417), and weight.
- Calculate the body mass index (BMI; p. 59).
- Test the urine for glycosuria (diabetes mellitus) and proteinuria (hypertensive renal damage).
- Formal psychological evaluation may be helpful in selected patients. Two-thirds of patients with Cushing's syndrome have psychological or psychiatric features.

THE THYROID GLAND

Anatomy

The thyroid gland is butterfly-shaped and comprises two symmetrical lobes joined by a central isthmus that normally covers the second and third tracheal rings (Fig. 5.2A). The gland may extend into the superior mediastinum, or may occasionally be entirely retrosternal. Rarely, it is located higher in the neck along the line of the thyroglossal duct. If situated at the back of the tongue (lingual goitre), it may be visible through the open mouth. The normal thyroid gland is palpable in about 50% of women and 25% of men. Goitre is enlargement of the thyroid gland.

Examination sequence

The thyroid gland

- Inspect the neck from the front.
- Look for a swelling while the patient swallows a sip of water. The thyroid (or a thyroglossal cyst) moves upwards on swallowing since it is enveloped in the pre-tracheal fascia which is attached to the cricoid cartilage.
- Ask the patient to sit with the neck muscles relaxed and stand behind him.
- Place your hands gently on the front of the patient's neck, with your index fingers just touching (Fig. 5.2B). Ask the patient to swallow a sip of water while you feel over the gland as it moves upwards. Some patients find neck palpation uncomfortable, so be alert for any signs of distress.
- Note the size, shape and consistency of any goitre and feel for any thrill. Measure any discrete nodules with calipers. With large goitres, record the maximum neck circumference using a tape measure (an objective measurement for long-term follow-up).
- Listen with your stethoscope for a thyroid bruit.

Abnormal findings

Shape and surface

Simple goitres are relatively symmetrical in their earlier stages but often become nodular with time. In Graves' disease the surface of the thyroid gland is usually smooth and diffuse, whereas it is irregular in uninodular or multinodular goitre (Fig. 5.3).

Mobility

Most goitres move upwards with swallowing. Very large goitres may be immobile, and invasive thyroid cancer may fix the gland to surrounding structures.

Consistency

Nodules in the substance of the gland may be large or small, and single or multiple, and are usually benign. A very hard consistency suggests malignant change in the gland. Large, firm lymph nodes near a goitre suggest thyroid cancer (Fig. 5.4).

Tenderness

Diffuse tenderness is typical of viral thyroiditis, whereas localized tenderness may follow bleeding into a thyroid cyst.

Thyroid bruit

This indicates abnormally high blood flow and can be associated with a palpable thrill. It occurs in hyperthyroidism. A thyroid bruit may be confused with other sounds. A bruit arising from the carotid artery or

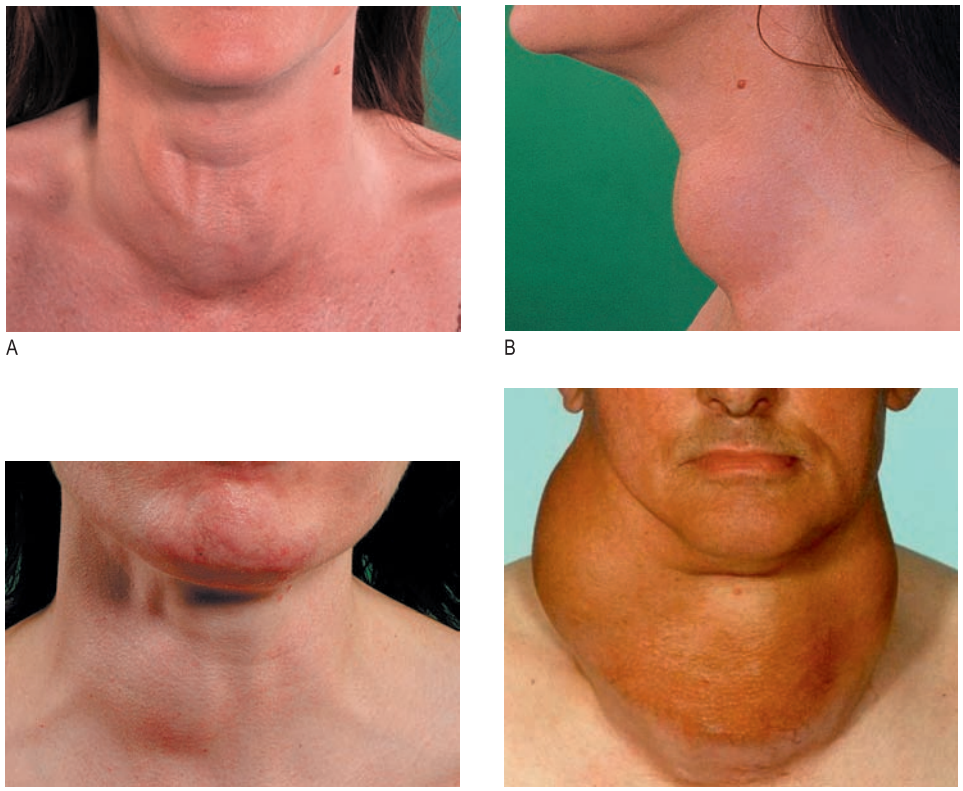


Fig. 5.3 **Goitres.** **(A** and **B)** Diffuse — Graves' disease. **(C)** Uninodular — toxic nodule. **(D)** Multinodular.

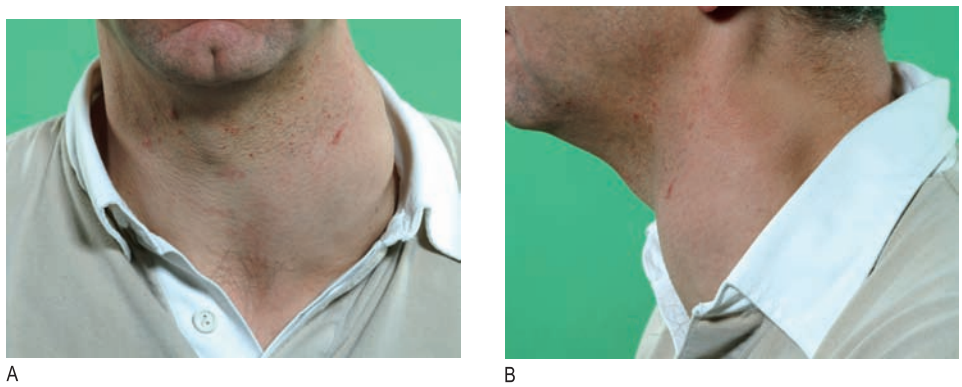


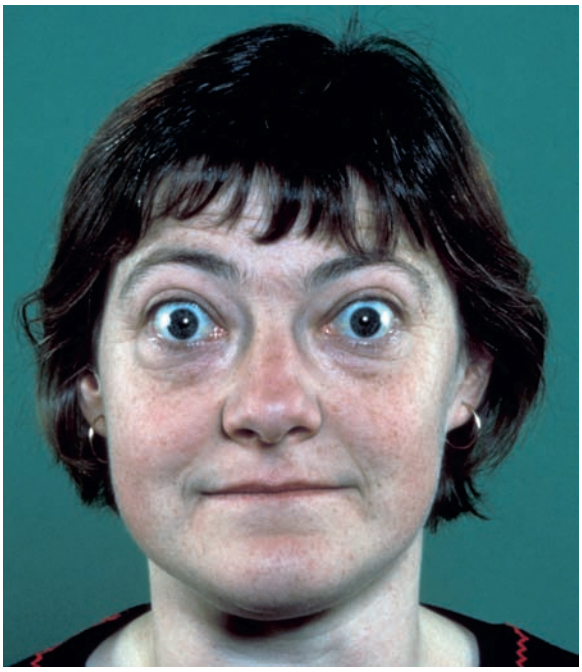
Fig. 5.4 **Thyroid cancer.** Papillary thyroid cancer with regional cervical lymphadenopathy.

transmitted from the aorta will be louder along the line of the artery. Transient gentle pressure over the root of the neck will interrupt a venous hum from the internal jugular vein.

Thyroid disease

Most hyperthyroidism is due to autoimmune Graves' disease. Look at the patient's face; lid retraction contributes to a rather startled-looking expression (Fig. 5.5A). Patients with Graves' disease may have associated thyroid eye disease, digital acropachy and pretibial myxoedema (Figs 5.5B–D).

Hypothyroidism is usually due to Hashimoto's thyroiditis. The facial appearance may be characteristic, particularly in older patients who usually have marked periorbital myxoedema (Fig. 5.6). Look for cold peripheries, dry skin and hair, bradycardia and delayed muscle relaxation when testing tendon reflexes.



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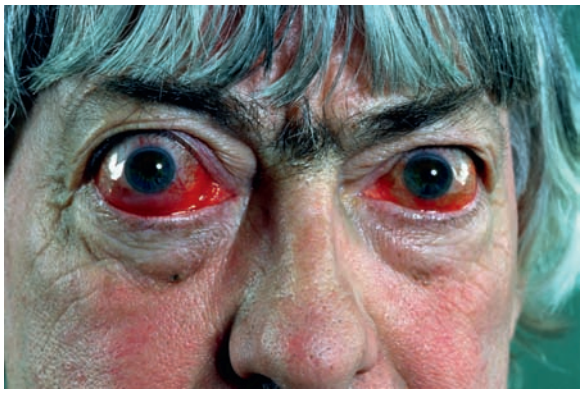

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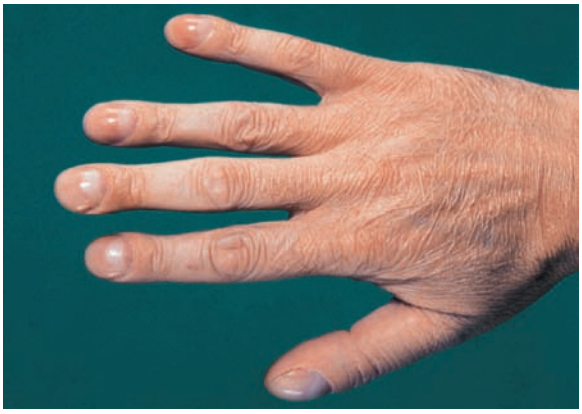

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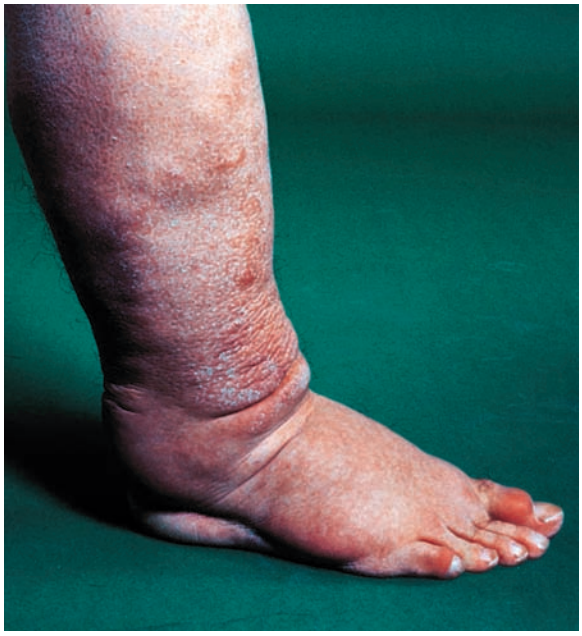

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Fig. 5.5 **Graves' hyperthyroidism.** **(A)** Typical facies. **(B)** Severe inflammatory thyroid eye disease. **(C)** Thyroid acropachy. **(D)** Pretibial myxoedema.

THE PARATHYROID GLANDS

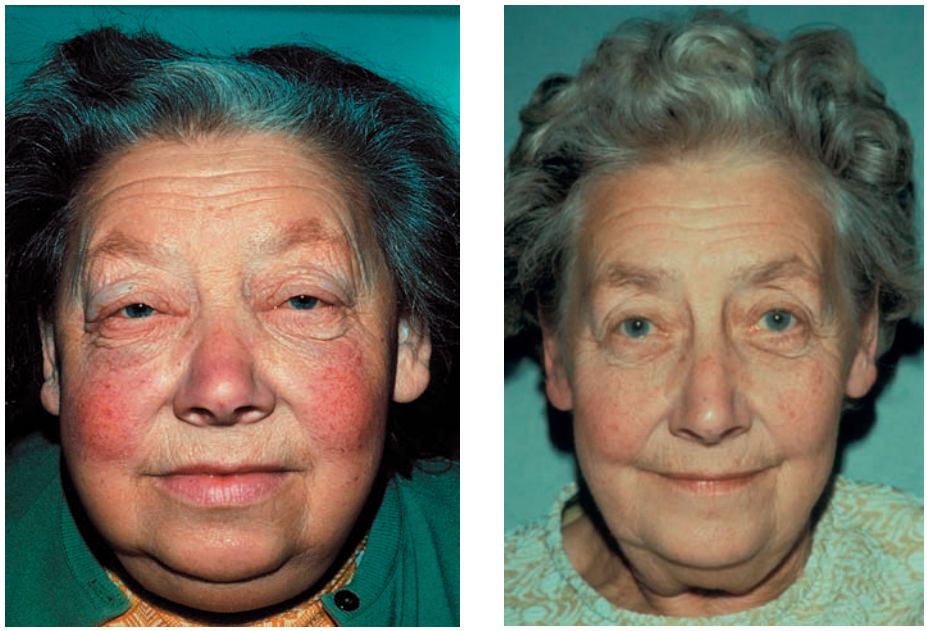
There are usually four parathyroid glands which lie posterior to the thyroid (Fig. 5.2A). Each is about the size of a pea and produces parathyroid hormone (PTH), a peptide which increases the level of calcium in the blood.

Parathyroid disease

Parathyroid disease produces few physical signs. A parathyroid tumour is rarely palpable in the neck in patients with hyperparathyroidism. Patients with longstanding disease may have corneal calcification best seen using a slit lamp (Fig. 5.7A). Tender areas of bone fracture deformity ('Brown tumours') may be found (Fig. 5.7B).

Patients with hypoparathyroidism may present with classical carpopedal spasms (tetany). If overt tetany is not present, assess for latent tetany by inflating a blood pressure cuff above arterial pressure for 3 minutes. Carpal muscle spasm should occur within 3 minutes ('main d'accoucheur' or Trousseau's sign).

Patients with autosomal dominant pseudohypoparathyroidism are typically short in stature, with round faces and characteristic shortening of some of the metacarpal bones (Figs 5.7C and D).



A B

Fig. 5.6 **Hypothyroidism.** **(A)** Before treatment. **(B)** After levothyroxine replacement.

OSCEs 5.3 Examine this patient with weight loss and heat intolerance

1. Shake hands and note excessive warmth and sweating.
2. Look for fine tremor of outstretched hands and acropachy of the fingers (hyperthyroidism).
3. Examine the radial pulse (usually rapid and high-volume unless on a β-blocker). An irregularly irregular pulse is likely to indicate atrial fibrillation.
4. Examine the thyroid and describe its size, surface and consistency. Listen for a thyroid bruit.
5. Look for evidence of thyroid eye disease.
6. Inspect the shins for pretibial myxoedema.

THE PANCREAS

The pancreas lies behind the stomach on the posterior abdominal wall. Its endocrine functions include the production of insulin, glucagon, somatostatin, gastrin and vasoactive intestinal peptide. Its exocrine function is to produce alkaline secretions containing digestive enzymes.

Diabetes mellitus

Diabetes mellitus is characterized by hyperglycaemia due to absolute or relative insulin deficiency. There are two main subtypes:

- type 1: severe insulin deficiency due to autoimmune destruction of the pancreatic islets
- type 2: commonly affects people who are obese and insulin-resistant, although impaired β-cell function is also important.

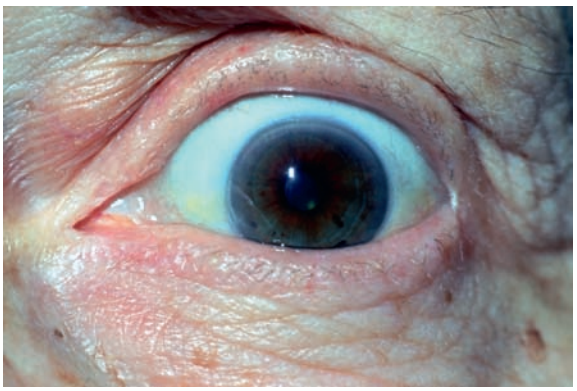
Microvascular, neuropathic and macrovascular complications of hyperglycaemia (Box 5.4) can occur in patients with any type of diabetes mellitus, and may be present at diagnosis in patients with slow-onset type 2 disease.

Diabetes may present with the classical triad of symptoms:

- polyuria: due to osmotic diuresis caused by glycosuria
- thirst: due to the resulting loss of fluid and electrolytes
- weight loss: due to fluid depletion and breakdown of fat and muscle secondary to insulin deficiency.

Other common symptoms include tiredness, blurred vision (due to glucose-induced changes in lens refraction) and itching of the genitalia (pruritus vulvae in women or balanitis in men) due to *Candida* yeast infection (thrush).

On examination there may be evidence of weight loss and dehydration, and in diabetic ketoacidosis the breath may have the sweet smell of ketones. Skin infections with boils and abscesses are common. Acanthosis nigricans (soft, velvety, brown skin) is a sign of hyperinsulinism and is seen frequently in the axillae and groins of patients with insulin-resistant type 2 diabetes (Fig. 5.8A). Necrobiosis lipoidica, due to collagen degeneration, may occur on the shins of some patients with type 1 diabetes and often causes chronic ulceration (Fig. 5.8B). The causes of diabetic foot ulceration are



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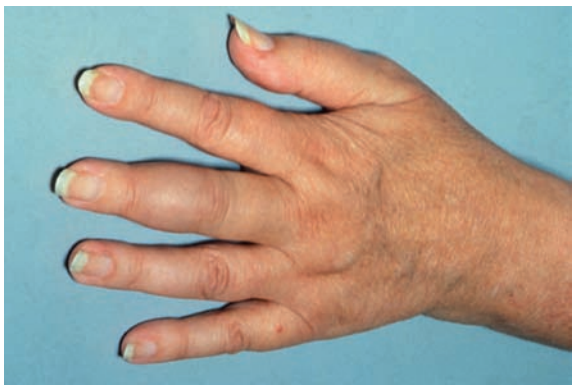

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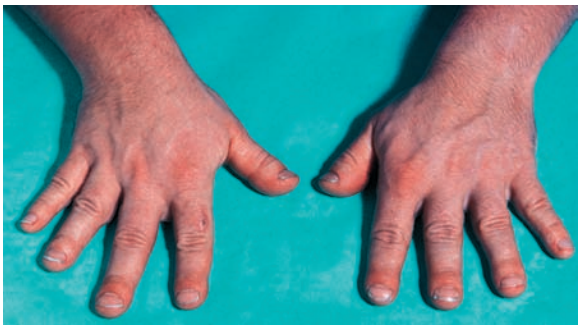

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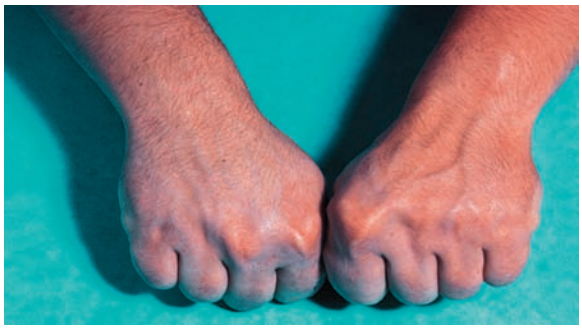

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Fig. 5.7 **Parathyroid disease.** **(A)** Corneal calcification in hyperparathyroidism. **(B)** 'Brown tumour' of the phalanx (middle finger) in hyperparathyroidism. **(C)** Pseudohypoparathyroidism: short metacarpals. **(D)** These are best seen when the patient makes a fist.

5.4 Complications of diabetes mellitus

Microvascular/neuropathic

- Retinopathy, cataract
  Impaired vision
- Nephropathy
  Protein loss, renal failure
- Peripheral neuropathy
  Sensory loss, motor weakness
- Autonomic neuropathy
  Postural hypotension, vomiting, diarrhoea
- Foot disease
  Ulceration, arthropathy

Macrovascular

- Coronary circulation
  Myocardial ischaemia/infarction
- Cerebral circulation
  Transient ischaemic attack (TIA), stroke
- Peripheral circulation
  Claudication, gangrene, amputation

multifactorial, including diabetic neuropathy, arterial insufficiency and increased susceptibility to infection (Fig. 5.8C). Look for xanthomata in all newly presenting diabetic patients; their presence indicates significant hyperlipidaemia (Fig. 5.8D). Examine insulin injection sites for evidence of lipohypertrophy (which may cause unpredictable insulin release), lipoatrophy (now rare) or signs of infection (very rare).

Insulin-dependent patients are particularly susceptible to acute metabolic decompensation due to hypoglycaemia or ketoacidosis, both of which require prompt clinical and biochemical recognition.

THE PITUITARY GLAND

The pituitary gland is enclosed in the sella turcica in the base of the skull beneath the hypothalamus. It is bridged over by a fold of dura mater (diaphragma sellae) with sphenoidal air spaces below and the optic chiasm above. The pituitary has two lobes:

- the anterior pituitary, which secretes several hormones (adrenocorticotrophic hormone (ACTH), prolactin, growth hormone (GH), TSH and gonadotrophins (luteinizing hormone (LH) and follicle-stimulating hormone (FSH))
- the posterior pituitary, an extension of the hypothalamus, which secretes vasopressin (antidiuretic hormone (ADH)) and oxytocin.

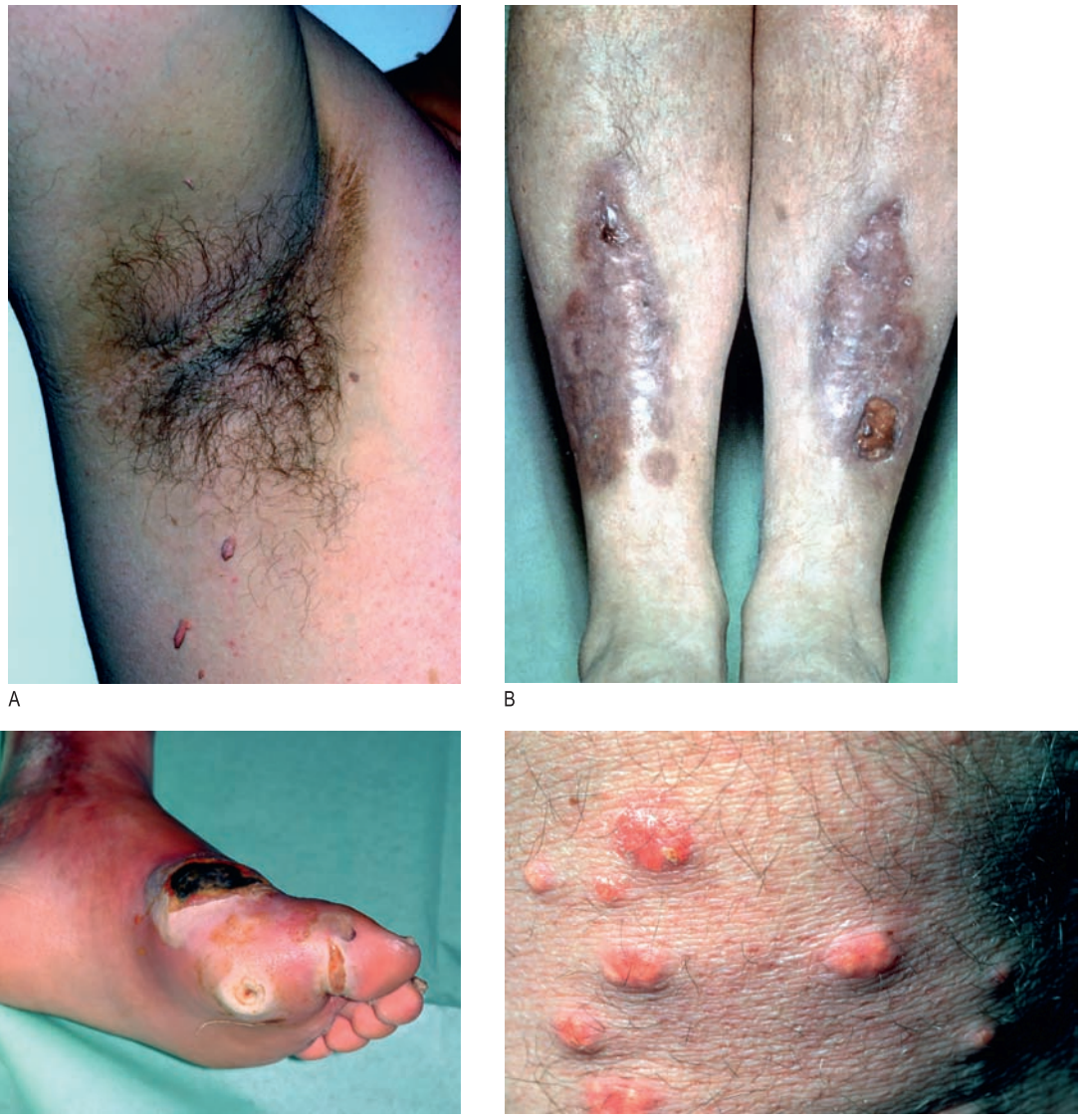


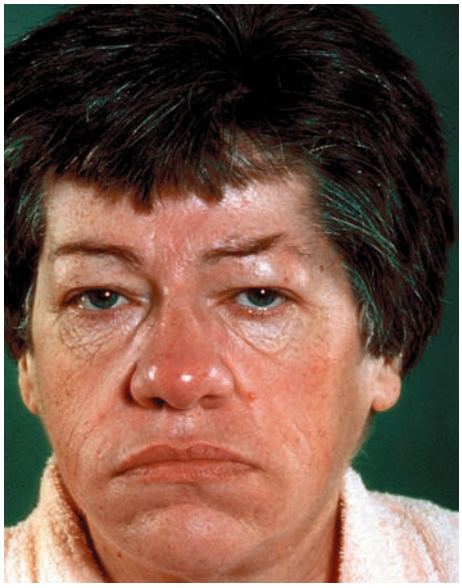
Fig. 5.8 Diabetes mellitus. (A) Acanthosis nigricans. **(B)** Necrobiosis lipoidica. **(C)** Diabetic foot ulcer. **(D)** Eruptive xanthomata.

Acromegaly

Acromegaly is caused by a GH-secreting pituitary tumour. GH stimulates excessive insulin-like growth factor-1 production by the liver, and this hormone is responsible for most of the clinical manifestations. Look for the characteristic facial changes, including coarsening of features, thick greasy skin, enlargement of the nose, prognathism (protrusion of the mandible) and separation of the lower teeth (Figs 5.9A and B). Expansion of the soft tissues of the hands and feet causes tight fitting of rings, gloves and footwear (Figs 5.9C and D). Expansion of the tumour can cause pressure on the optic chiasm, resulting in visual field defects, especially bitemporal hemianopia (Fig. 12.3, p. 309).

Hypopituitarism

Anterior hypopituitarism may be due to compression of the pituitary by a macroadenoma, infarction after childbirth (Sheehan's syndrome), severe head trauma or cranial radiotherapy. Look for extreme skin pallor (a combination of mild anaemia and melanocyte-stimulating hormone deficiency), reduced/absent secondary sexual hair and testicular atrophy (Fig. 5.10). Absence of axillary hair is abnormal after puberty.



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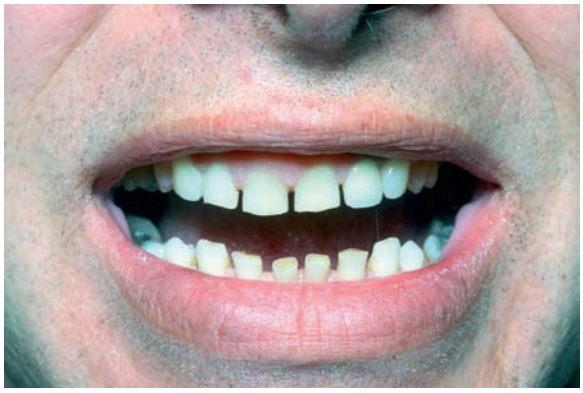

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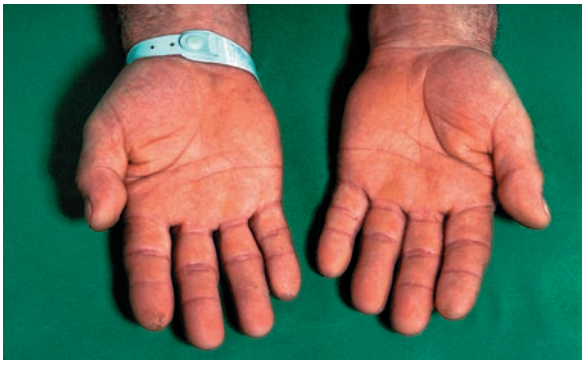

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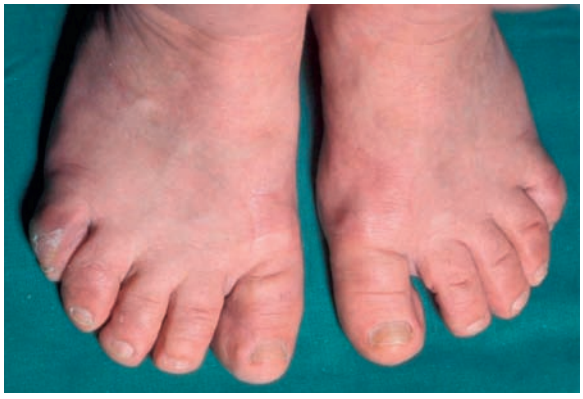

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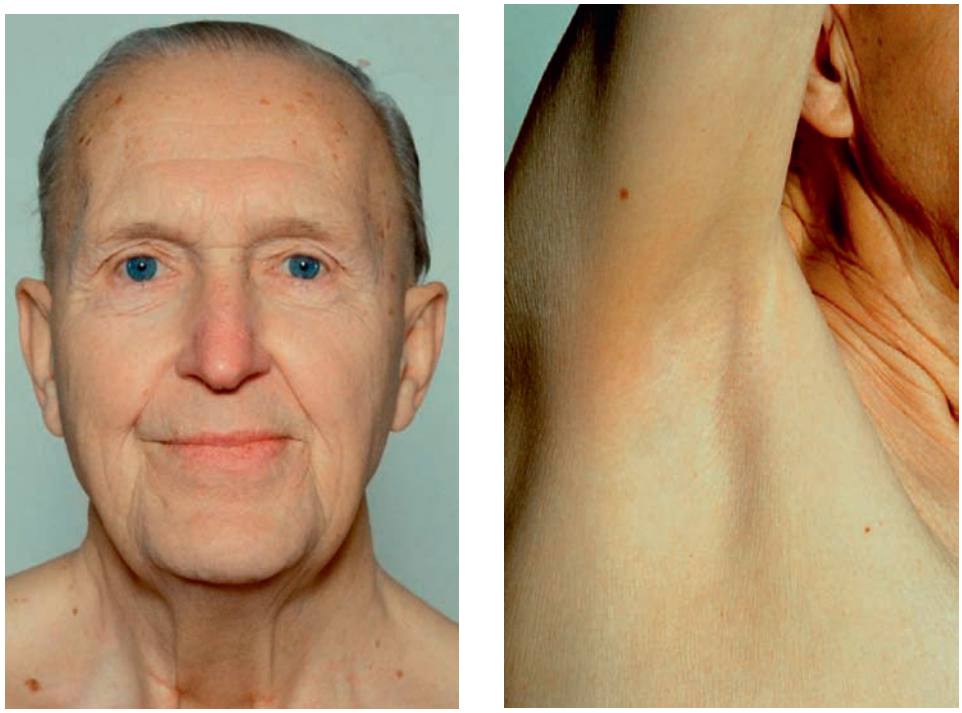
Fig. 5.9 **Acromegaly. (A)** Typical facies. **(B)** Separation of lower teeth. **(C)** Large fleshy hands. **(D)** Widening of the feet.

OSCEs 5.5 Examine this patient with excessive sweating and snoring

1. On greeting the patient, note the large, moist and fleshy hands.
2. Lift a pinch of skin from the dorsum of the hand and note its increased thickness.
3. Look at the face for signs of acromegaly: thick, greasy skin, especially over the forehead, large nose and tongue, prognathism and separation of lower teeth.
4. Inspect feet for increased soft tissues.
5. Look for signs of carpal tunnel syndrome (wasted thenar eminence(s), sensory loss).
6. Check visual fields (possible bitemporal hemianopia).
7. Measure BP (one-third of acromegalics have hypertension).
8. Test the urine for glycosuria (one-third of acromegalics have diabetes mellitus).



A B

Fig. 5.10 Hypopituitarism. (A) Hypopituitarism due to a pituitary adenoma (note the skin pallor). **(B)** Absent axillary hair.

THE ADRENAL GLANDS

The adrenal glands are small pyramidal organs lying immediately above the kidneys on their posteromedial surface.

- The adrenal medulla is part of the sympathetic nervous system and secretes catecholamines
- The adrenal cortex secretes cortisol, mineralocorticoids and androgens.

Cushing's syndrome

Cushing's syndrome is caused by excess exogenous or endogenous corticosteroid exposure. Most cases of Cushing's are iatrogenic, due to side-effects of corticosteroid therapy. 'Endogenous' Cushing's usually results from an ACTH-secreting pituitary microadenoma. Other causes include a primary adrenal tumour or 'ectopic' ACTH secretion.

The catabolic effects of steroids cause widespread tissue breakdown (particularly in skin, muscle and bone) with central accumulation of body fat. Proximal myopathy, fragility fractures, spontaneous purpura, skin thinning and susceptibility to infection are common (Fig. 5.11).

Addison's disease

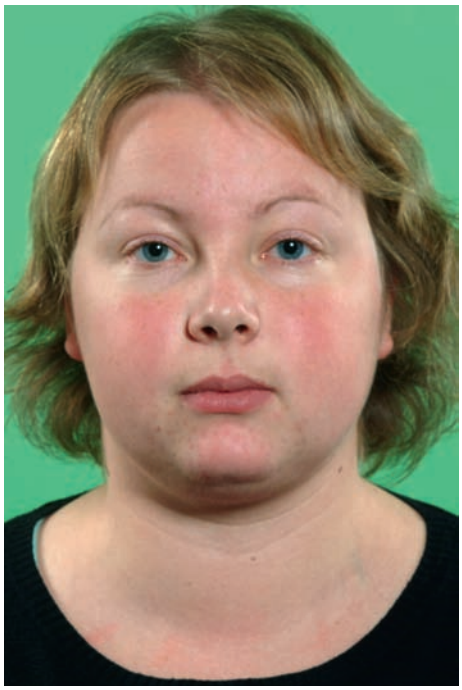
Addison's disease is due to inadequate secretion of cortisol, usually secondary to autoimmune destruction of the adrenal cortex. The melanocyte-stimulating hormone-dependent brown pigmentation of Addison's disease (primary adrenal insufficiency) is most striking in white Caucasians. It is most prominent in surface epithelia subject to trauma: that is, skin creases, pressure areas, buccal mucosa and healing scars (Figs 5.12A–C). Look also for areas of depigmented skin known as vitiligo in patients with Addison's disease (and other autoimmune endocrinopathies; Fig. 5.12D).

THE GONADS

These glands secrete sex hormones (oestrogen and testosterone) in response to gonadotrophins released by the pituitary. They also contain the germ cells.

Reproductive disorders

Klinefelter's syndrome (47XYY) is the most common cause of primary hypogonadism in men (1:600



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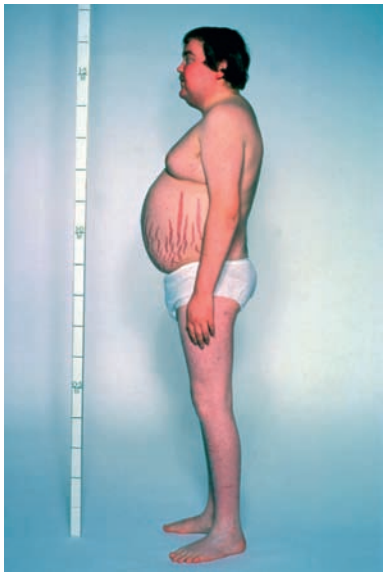

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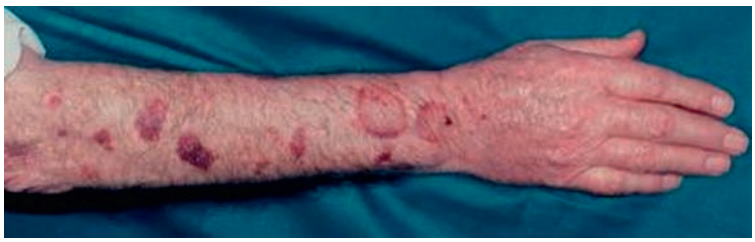

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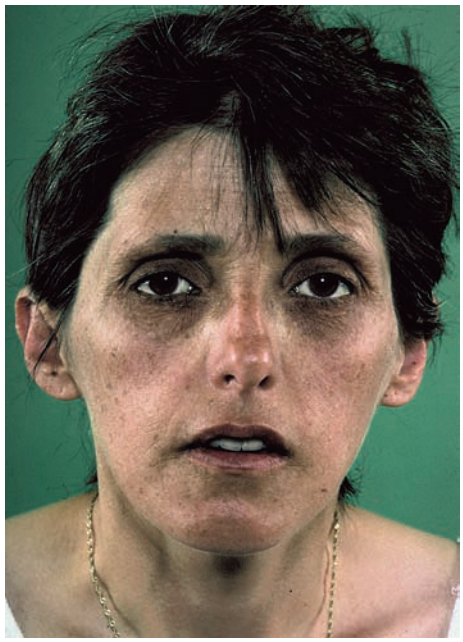
Fig. 5.11 **Cushing's syndrome.** **(A)** Cushingoid facies. **(B)** After curative pituitary surgery. **(C)** Typical features: facial rounding, central obesity, proximal muscle wasting and skin striae. **(D)** Skin thinning: purpura caused by wristwatch pressure.

live male births). Diagnosis may be delayed until later life, by which time the features of prolonged testosterone deficiency can be seen. Look for soft, finely wrinkled, hairless facial skin and gynaecomastia and examine the genitalia (pubic hair is often reduced/absent and the testes <3 ml in volume; Fig. 5.13).

Hirsutism (excess body and facial hair) is common in women with PCOS (Fig. 5.14). Examine women with a short history of severe hirsutism for signs of virilization which suggest a possible testosterone-secreting tumour; look for temporal recession of the scalp hair, deepening of the voice, increased muscle bulk and clitoromegaly (Fig. 5.15).



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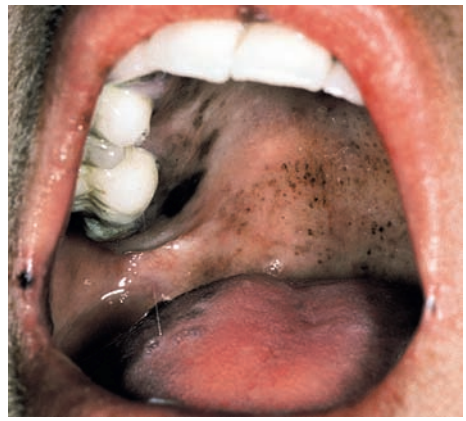

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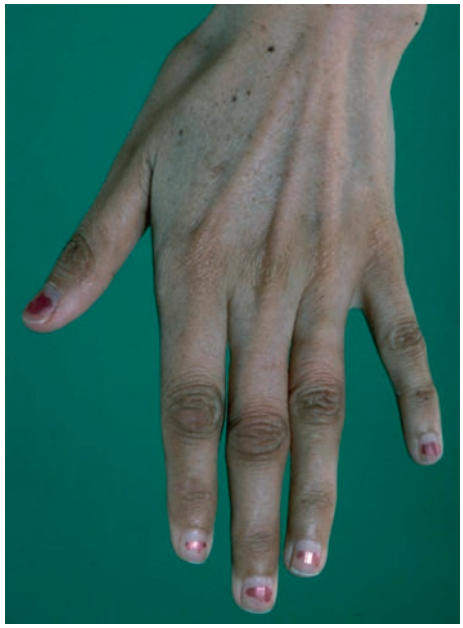

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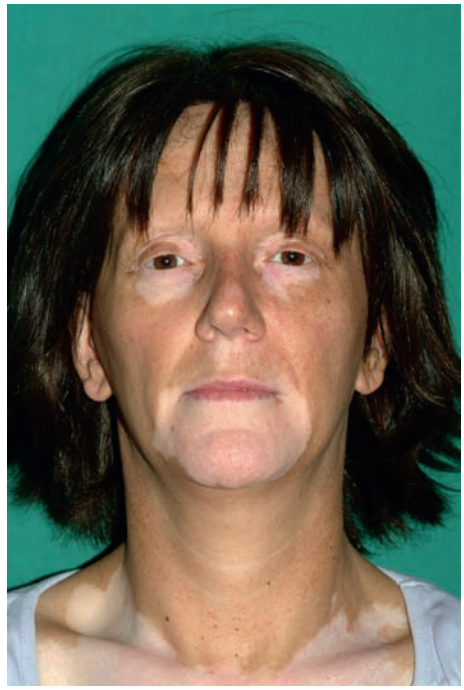

D

Fig. 5.12 **Addison's disease.** **(A)** Facial pigmentation. **(B)** Buccal pigmentation. **(C)** Skin crease pigmentation. **(D)** Vitiligo — particularly striking due to Addisonian pigmentation of the 'normal' skin.

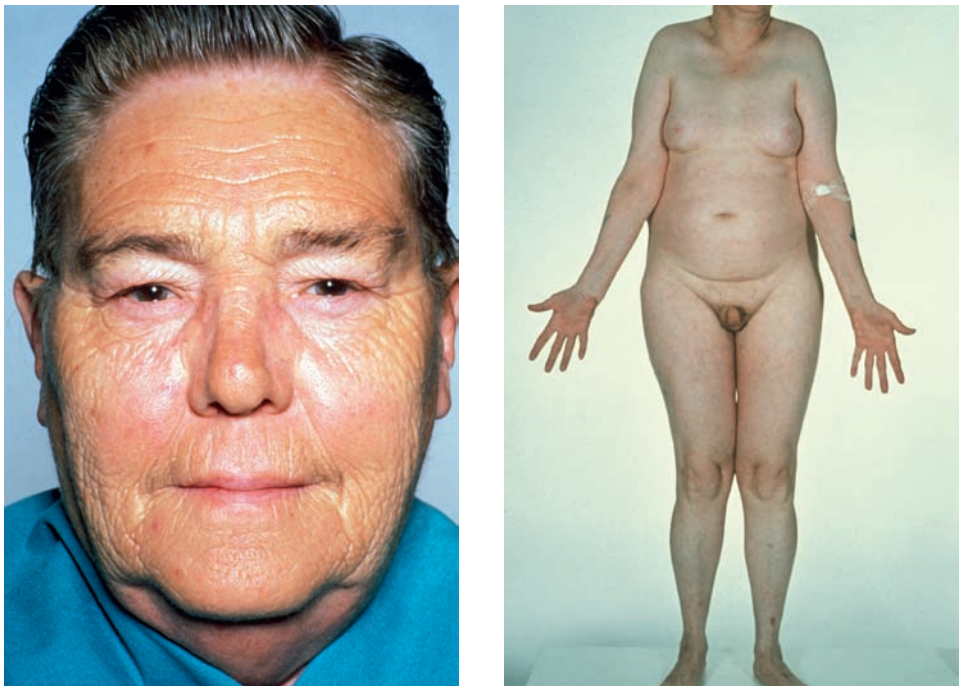

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Fig. 5.13 **Klinefelter's syndrome.** **(A)** Hypogonadal facial skin. **(B)** Gynaecomastia, reduced pubic hair and small testes.

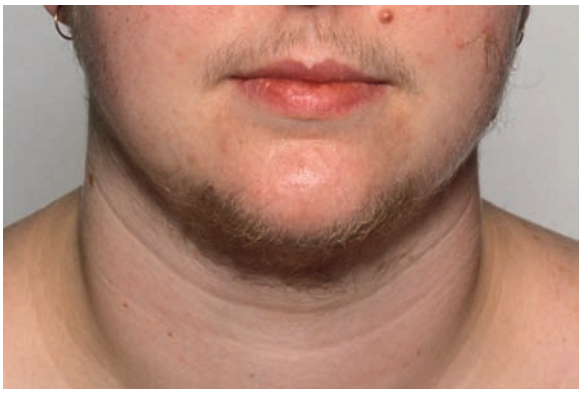


Fig. 5.14 **Polycystic ovary syndrome.** Facial hirsutism.

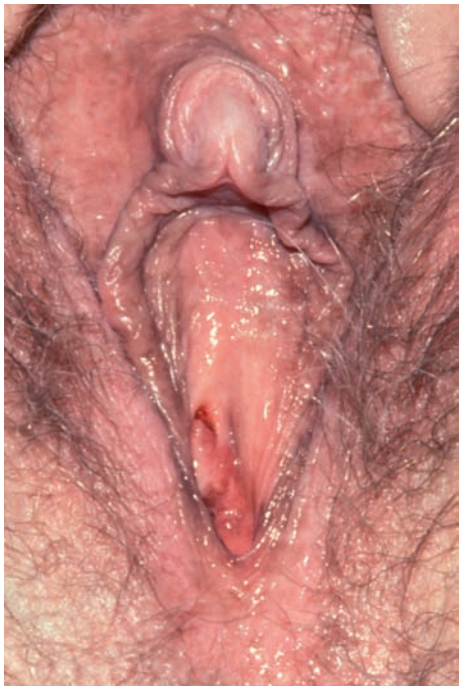


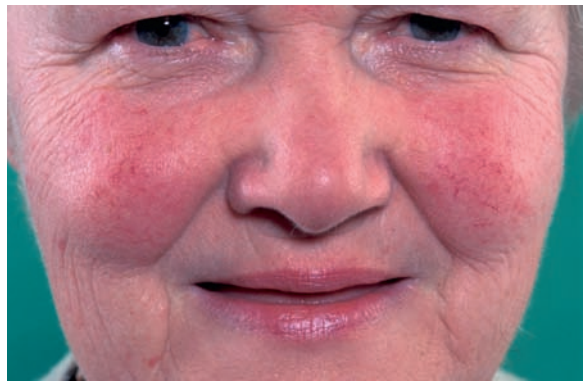
Fig. 5.15 **Testosterone-secreting ovarian tumour**. Clitoromegaly.

OSCEs 5.6 Examine this patient with tiredness and pallor

1. Look for signs of chronic blood loss or iron deficiency — pallor, angular stomatitis, koilonychia.
2. Look at face for puffiness about the eyes (hypothyroidism) and, in men, poor beard growth (hypopituitarism).
3. Listen to voice — slow, deliberate, croaky (hypothyroidism).
4. Measure BP — hypotension in hypovolaemia, Addison's disease and hypopituitarism.
5. Feel the neck for goitre (hypothyroidism).
6. Palpate abdomen for tenderness, masses and hepatosplenomegaly.
7. Examine for absence of axillary and pubic hair (hypopituitarism).
8. Examine external genitalia — small testes in men (hypopituitarism).
9. Examine visual fields — bitemporal hemianopia (pituitary tumour).
10. Percuss tendon reflexes — delayed relaxation in hypothyroidism.

OSCEs 5.7 Examine this patient with weight loss and a good appetite

1. Observe patient's demeanour — hyperactive, 'staring eyes' (hyperthyroidism).
2. Examine eyes for lid lag and proptosis (thyroid eye disease).
3. Look for signs of dehydration — dry tongue, lack of skin turgor, e.g. diabetes mellitus, coeliac disease.
4. Examine hands for finger clubbing (coeliac disease), warmth, sweating, fine tremor (hyperthyroidism).
5. Examine nails for any onycholysis or thyroid acropachy (hyperthyroidism).
6. Feel pulse — tachycardia in hyperthyroidism, bradycardia in hypothyroidism.
7. Palpate neck for goitre (diffuse or nodular).
8. Look at legs for pretibial myxoedema.
9. Look at optic fundi for diabetic retinopathy.
10. Perform urinalysis for glycosuria (diabetes mellitus).



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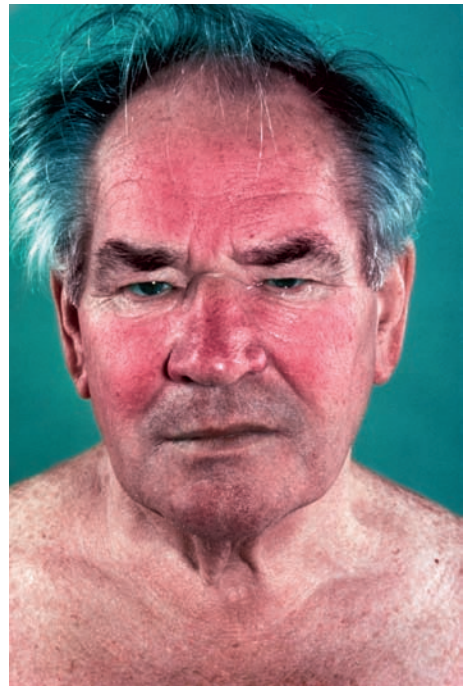


B

Fig. 5.16 Carcinoid syndrome. (A) Acute carcinoid flush. **(B)** Chronic telangiectasia.

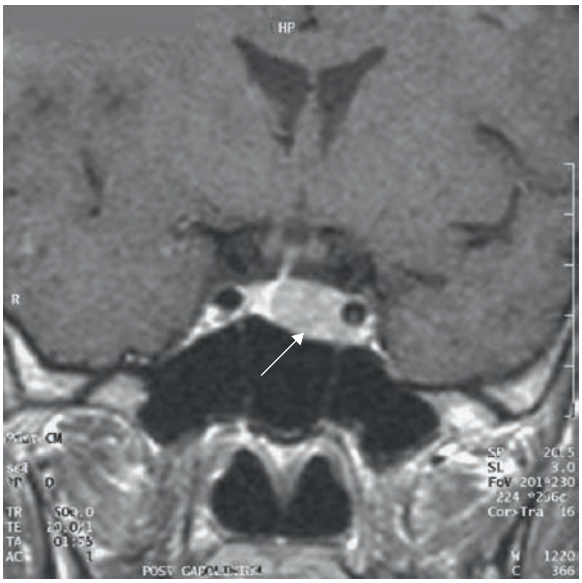
OTHER ENDOCRINE DISORDERS

Carcinoid syndrome

Liver metastases from mid-gut carcinoid tumours release vasoactive chemicals into the systemic circulation which cause flushing, diarrhoea and bronchospasm. Bending, exercise or even palpation of the enlarged liver may induce typical skin flushing. Permanent facial telangiectasia occurs after many years of carcinoid flushing (Fig. 5.16).

INVESTIGATIONS

Serum hormone levels are measured to assess over- or under-activity. Suppression tests can determine whether hormonal secretion is autonomous. Stimulation tests assess hormonal reserve (or lack of it in deficiency states). Modern imaging enables visualization of small endocrine tumours, sometimes only a few millimetres in diameter (Box 5.8 and Fig. 5.17).



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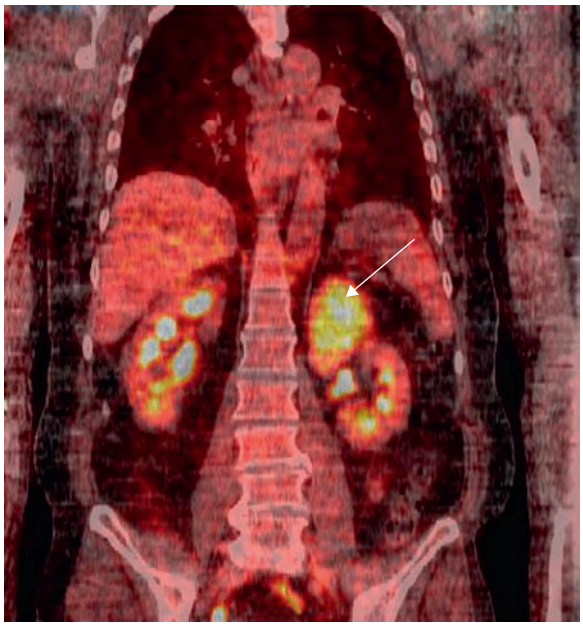

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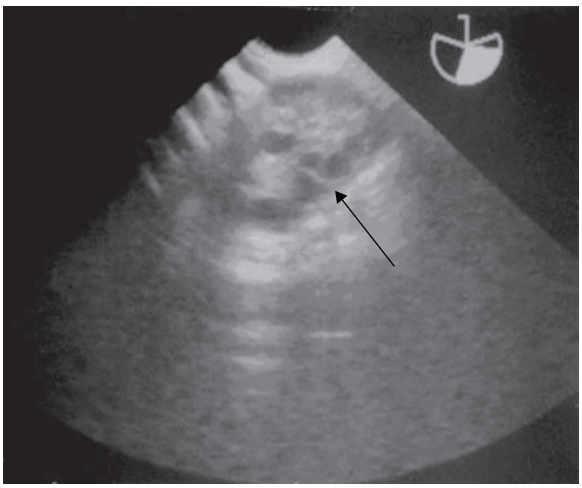

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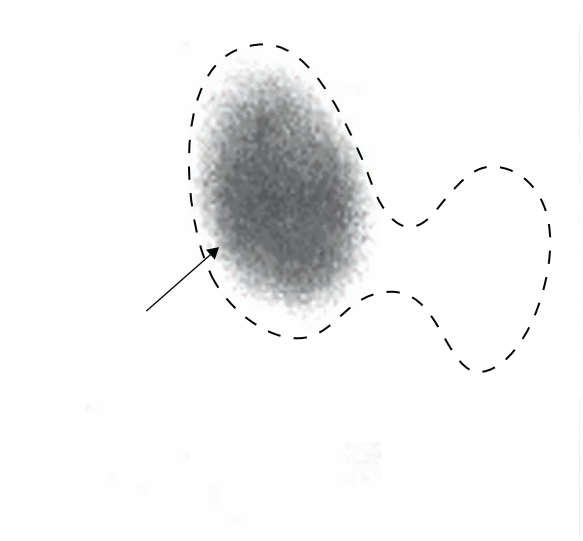

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Fig. 5.17 Endocrine imaging. (A) MRI showing pituitary macroadenoma. **(B)** PET-CT showing an adrenal cancer. **(C)** Ultrasound showing polycystic ovary. **(D)** ^{99m}Technetium radionuclide scan confirming unilateral toxic thyroid adenoma (arrowed) — dotted line shows outline of thyroid.

5.8 Investigations in endocrine disease

Investigation	Indication/comment
Bedside	
Urinalysis	Glycosuria in diabetes mellitus Proteinuria in hypertensive renal damage
Capillary blood glucose	High in diabetes mellitus
Blood	
Calcium	High in hyperparathyroidism
Free thyroxine	High in hyperthyroidism Low in hypothyroidism
TSH	Undetectable in hyperthyroidism High in primary hypothyroidism
Serum cortisol	Low in hypoadrenalism, usually with reduced Synacthen response Loss of diurnal rhythm in Cushing's Reduced dexamethasone suppressibility in Cushing's
Gonadotrophins	High in primary hypogonadism in both sexes
Imaging	
Ultrasound	Thyroid, parathyroid, ovary, testis
MRI	Pituitary, pancreas
CT	Pancreas, adrenal
Radionuclide	Thyroid (^{123}I), parathyroid (^{99m}Tc-sesta-MIBI), adrenal (^{123}I-mIBG), neuroendocrine tumours (^{123}I-octreotide)
Positron emission tomography (PET) CT	Thyroid and neuroendocrine tumours
Invasive	
Fine needle aspiration cytology	Thyroid nodule
Inferior petrosal sinus sampling for ACTH	ACTH-dependent Cushing's

5.9 Key points: the endocrine system

- Symptoms of endocrine disturbance are varied and non-specific, and affect many body systems.
- Look carefully at the face for a 'spot' endocrine diagnosis.
- The thyroid gland moves upwards on swallowing (as does a thyroglossal cyst).
- Always palpate the thyroid gland from behind the patient.
- Hyperthyroidism is usually due to autoimmune Graves' disease, which may be associated with thyroid eye disease.
- Periorbital myxoedema is characteristic in primary hypothyroidism.
- Diabetes mellitus may present with the triad of polyuria, thirst and weight loss.
- Diabetic foot ulceration may be due to neuropathy, arterial insufficiency and increased susceptibility to infection.
- Acromegaly presents with characteristic facial features.
- Cushing's syndrome causes tissue breakdown of skin, muscle and bone with central accumulation of fat.
- Addison's disease causes pigmentation of the skin, particularly skin creases, pressure areas, buccal mucosa and healing scars.
- Excess body and facial hair in women (hirsutism) is common in PCOS.