- **MEDICINAL FORMS** There can be variation in the licensing of different medicines containing the same drug. Forms available from special-order manufacturers include: oral suspension

**Solution for injection**

- **Noristerat** (Bayer Plc)
  **Norethisterone enantate 200 mg per 1 ml** Noristerat 200mg/1ml solution for injection ampoules | 1 ampoule PoM £4.05

**Tablet**

- **Norethisterone (Non-proprietary)**
  **Norethisterone 5 mg** Norethisterone 5mg tablets | 30 tablet PoM £4.15 DT = £2.70
- **Noriday** (Pfizer Ltd)
  **Norethisterone 350 microgram** Noriday 350microgram tablets | 84 tablet PoM £2.10 DT = £2.10
- **Primolut N** (Bayer Plc)
  **Norethisterone 5 mg** Primolut N 5mg tablets | 30 tablet PoM £2.26 DT = £2.70
- **Utovlan** (Pfizer Ltd)
  **Norethisterone 5 mg** Utovlan 5mg tablets | 30 tablet PoM £1.40 DT = £2.70 | 90 tablet PoM £4.21

# 7.2 Male sex hormone responsive conditions

## Androgens, anti-androgens and anabolic steroids

### Androgens

Androgens cause masculinisation; they are used as replacement therapy in androgen deficiency, in delayed puberty, and in those who are hypogonadal due to either pituitary or testicular disease.

When given to patients with hypopituitarism androgens can lead to normal sexual development and potency but not to fertility. If fertility is desired, the usual treatment is with gonadotrophins or pulsatile gonadotrophin-releasing hormone which stimulates spermatogenesis as well as androgen production.

Intramuscular depot preparations of **testosterone esters** are preferred for replacement therapy. Testosterone enantate or propionate or alternatively *Sustanon*®, which consists of a mixture of testosterone esters and has a longer duration of action, can be used. For induction of puberty, depot testosterone injections are given monthly and the doses increased every 6 to 12 months according to response. Single ester testosterone injections may need to be given more frequently.

Oral **testosterone undecanoate** is used for induction of puberty. An alternative approach that promotes growth rather than sexual maturation uses oral oxandrolone below.

Testosterone topical gel is also available but experience of use in children under 15 years is limited. Topical testosterone is applied to the penis in the treatment of microphallus; an extemporaneously prepared cream should be used because the alcohol in proprietary gel formulations causes irritation.

### Anti-androgens and precocious puberty

The gonadorelin stimulation test is used to distinguish between *gonadotrophin-dependent (central) precocious puberty* and *gonadotrophin-independent precocious puberty*. Treatment requires specialist management.

Gonadorelin analogues, used in the management of gonadotrophin-dependent precocious puberty, delay development of secondary sexual characteristics and growth velocity.

Testolactone p. 521 and cyproterone acetate p. 520 are used in the management of gonadotrophin-independent precocious puberty, resulting from McCune-Albright syndrome, familial male precocious puberty (testotoxicosis), hormone-secreting tumours, and ovarian and testicular disorders. Testolactone inhibits the aromatisation of testosterone, the rate limiting step in oestrogen synthesis. Cyproterone acetate is a progestogen with anti-androgen properties.

Spironolactone p. 133 is sometimes used in combination with testolactone because it has some androgen receptor blocking properties.

High blood concentration of sex hormones may activate release of gonadotrophin releasing hormone, leading to development of secondary, central gonadotrophin-dependent precocious puberty. This may require the addition of gonadorelin analogues to prevent progression of pubertal development and skeletal maturation.

Anabolic steroids have some androgenic activity but they cause less virilisation than androgens in girls. They are used in the treatment of some *aplastic anaemias*.

Oxandrolone is used to stimulate late pre-puberal growth prior to induction of sexual maturation in boys with short stature and in girls with Turner's syndrome; specialist management is required.

**ANABOLIC STEROIDS** › ANDROSTAN DERIVATIVES

### Oxandrolone

- **INDICATIONS AND DOSE**

**Stimulation of late pre-pubertal growth in boys (of appropriate age) with short stature**

- BY MOUTH
- Child 10–17 years (male): 1.25–2.5 mg daily for 3–6 months.

**Stimulation of late pre-pubertal growth in girls with Turner's syndrome**

- BY MOUTH
- Child (female): 0.625–2.5 mg daily, to be taken in combination with growth hormone.

- **CONTRA-INDICATIONS** History of primary liver tumours · hypercalcaemia · nephrosis
- **CAUTIONS** Cardiac impairment · diabetes mellitus · epilepsy · hypertension · migraine · skeletal metastases (risk of hypercalcaemia)
- **SIDE-EFFECTS**
- **Common or very common** Androgenetic alopecia · androgenic effects · anxiety · asthenia · bone formation increased · depression · electrolyte imbalance · epiphyses premature fusion (in pre-pubertal males) · gastrointestinal haemorrhage · gynaecomastia · headache · hirsutism · hypertension · jaundice cholestatic · nausea · oedema · paraesthesia · polycythaemia · precocious puberty (in pre-pubertal males) · seborrhoea · sexual dysfunction · skin reactions · spermatogenesis reduced · virilism · weight increased
- **Rare or very rare** Hepatic neoplasm
- **Frequency not known** Sleep apnoea
- **PREGNANCY** Avoid—causes masculinisation of female fetus.
- **BREAST FEEDING** Avoid; may cause masculinisation in the female infant or precocious development in the male infant. High doses suppress lactation.
- **HEPATIC IMPAIRMENT** Avoid if possible—fluid retention and dose-related toxicity.
- **RENAL IMPAIRMENT** Use with caution—potential for fluid retention.