Precocious (Early Onset) Puberty

**Definition / Supporting Information**

Normal puberty is a series of complex hormonal changes that begins at 8–13 years of age in girls and at 9–14 years of age in boys.

Precocious puberty is the appearance of secondary sexual characteristics before the age of 8 years in girls and 9 years in boys.

Premature thelarche: isolated premature breast development.

Premature adrenarche: isolated premature development of sexual hair.

**Essential History**

Ask about:

- Growth
- Development
- Significant illnesses
- Family history of pubertal onset and progression

**‘Red Flag’ Symptoms and Signs**

Ask about:

- Exposure to medications that can affect puberty (eg, exposure to external sources of oestrogen or testosterone, such as creams or ointments)
- Fatigue
- Headache
- Vomiting
- Loss of balance
- Unsteadiness

Look for:

- Abnormal growth parameters
- Abnormal velocity of growth
- Premature pubertal development on Tanner staging (see Puberty and the Tanner Stages (pdf))
- Gynaecomastia in boys
- Abnormalities on neurological examination of:
  - Tone
– Power
– Co-ordination
– Visual fields
– Fundoscopy

**Differential Diagnosis / Conditions**

**Isosexual precocious puberty (phenotypically appropriate)**

- Central (with pituitary gonadotrophin and sex-steroid secretion due to early stimulation of the hypothalamic-pituitary axis)
  - Idiopathic
  - Following adoption (of a child from the developed world)
  - Central nervous system abnormalities
  - Diagnosis is made only after a search for a pathologic cause is negative, including:
    - Congenital anomalies (hydrocephalus)
    - Tumours (hypothalamic, pineal, other)
    - Hamartoma
    - Post-infection
    - Trauma
    - Post cranial radiotherapy
    - Neurofibromatosis
    - Tuberous sclerosis
    - Hypothyroidism (severe)

- Gonadotrophin-independent (peripheral) precocious puberty
  - Exogenous sex steroids
    - Both testes are small
  - Gonadal tumours or cysts
  - Adrenal hyperplasia or tumour
    - Both testes are small
  - Ectopic gonadotrophin-secreting tumours (chorioepithelioma, hepatoblastoma, or teratoma)
    - Both testes are of pubertal size
  - Familial Leydig cell hyperplasia
    - Receptor mutation
  - McCune-Albright syndrome
    - G-protein mutation
Heterosexual precocious puberty (masculinisation of females, feminisation of males)

- **Girls**
  - Congenital adrenal hyperplasia
  - Androgen-secreting tumours
    - Adrenal
    - Ovarian
    - Teratoma
  - Exogenous androgens
- **Boys**
  - Oestrogen-producing tumours
    - Adrenal
    - Teratoma
    - Hepatoma
    - Testicular
  - Exogenous oestrogens
  - Increased peripheral conversion of androgens to oestrogens

**Investigations**

To be undertaken by non-specialist practitioners (e.g., General Practitioner (GP) Team, where indicated, following advice from specialist practitioners) or by specialist practitioners (e.g., Emergency Department / General Paediatric / Paediatric Endocrinology Team(s)) according to the clinical condition or age:

- Luteinising hormone (LH)
- Follicle-stimulating hormone (FSH)
- Oestradiol
- Testosterone
- Thyroid-stimulating hormone
- Thyroid hormone

To be undertaken by specialist practitioners (e.g., General Paediatric / Paediatric Endocrinology Team(s)) if not already done:

- Dehydroepiandrosterone sulfate
- 17-Hydroxyprogesterone
- Urinary steroid profile
- Serum β-human chorionic gonadotrophin
- Gonadotrophin-releasing hormone (GnRH)
  - Measurement of serum gonadotrophin levels before and after injection of GnRH usually distinguishes central and peripheral precocious puberty.
Key Practice Points
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- As indicated from clinical assessment
  - Bone age
  - Brain magnetic resonance imaging
  - Pelvic ultrasonography

**Treatment Approach**

To be undertaken by specialist practitioners (eg, General Paediatric / Paediatric Endocrinology Team(s)):

- **Idiopathic central precocious puberty**
  - GnRH analogues
    - Depot triptorelin (Gonapeptyl®) is used most commonly in the UK

- **Gonadotrophin-independent precocious puberty**
  - Letrozole and other aromatase inhibitors (eg, anastrozole, testolactone)
  - Spironolactone (androgen receptor inhibitor)
  - Ketoconazole (steroidogenesis inhibitor)

- **McCune-Albright syndrome**
  - Letrozole (aromatase inhibitor) or tamoxifen (oestrogen receptor inhibitor) have both been used

- **Heterosexual precocious puberty**
  - Removal of sex hormone source (exogenous or tumour)
  - Suppression with glucocorticoid replacement therapy (congenital adrenal hyperplasia)

**When to Refer**

Refer urgently to specialist practitioners (eg, Emergency Department / General Paediatric / Paediatric Endocrinology Team(s)) if signs or symptoms of precocious puberty are accompanied by:

- Symptoms of neurological disease:
  - Headache
  - Vomiting
  - Loss of balance
  - Unsteadiness

- Abnormalities on neurological examination of:
  - Tone
  - Power
  - Co-ordination
  - Visual fields
  - Fundoscopy
Refer to specialist practitioners (eg, General Paediatric / Paediatric Endocrinology Team(s)) if:

- Precocious puberty is suspected:
  - Signs of puberty before 8 years of age in girls
  - Signs of puberty before 9 years of age in boys
  - Rapidly progressive puberty (eg, Tanner stage 3 breast when first noted)
- Heterosexual precocious puberty
  - Hormonal abnormalities identified by initial screening tests
  - Parental or physician discomfort

‘Safety Netting’ Advice

- For premature thelarche and premature adrenarche, careful follow-up, physical examinations, and assessment of height and weight are necessary to ensure they do not represent early stages of complete sexual precocity
- Liaison with family and other healthcare professionals (eg, school nurse) may be required to address issues such as sexual behaviour and menstruation

Patient / Carer Information

*Please note: whilst these resources have been developed to a high standard they may not be specific to children.*

- Puberty (Web page), the NHS website
- Puberty – Complications (Web page), the NHS website

Resources

National Clinical Guidance

Endocrine conditions overview (Web page), NICE pathway, National Institute for Health and Care Excellence.

Suggested Resources

*Please note: these resources include links to external websites. These resources may not have national accreditation and therefore PCO UK cannot guarantee the accuracy of the content.*


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