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 (eg, General Practitioner (GP) Team, where indicated, following advice from specialist practitioners) or by specialist practitioners (eg, 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 (eg, 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.

- 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.

Brook CGD, Dattani MT. Handbook of Clinical Pediatric Endocrinology. 2nd edn. Chichester: Wiley-Blackwell; 2012.

Tanner JM. Growth and endocrinology of the adolescent. In: Gardner LI, ed. Endocrine and Genetic Diseases of Childhood and Adolescence. Philadelphia, PA: WB Saunders; 1975.

Thomas MA, Rebar RW. Delayed puberty in girls and primary amenorrhea. Curr Ther Endocrinol Metab. 1997;6:223–226. [PubMed]

Wales JKH. Disordered pubertal development. Arch Dis Child Educ Pract Ed. 2012;97:9–16. [PubMed]

Acknowledgements

Content Editor: Dr Jan Dudley

Clinical Expert Reviewer: Dr John Barton

GP Reviewer: Dr Ian A Dunn

AAP Reviewer: Jane Meschan Foy, MD, FAAP

Paediatric Trainee Reviewer: Dr Robert Hegarty

Paediatric Specialty Group: British Society for Paediatric Endocrinology and Diabetes

Update information

Created: 2016

Date last updated: -

Next review due: 2019