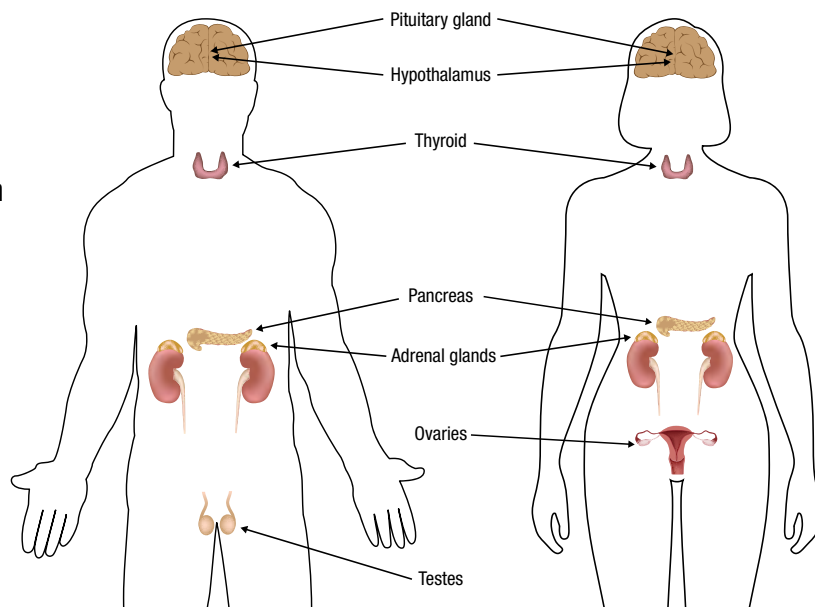


Endocrine Problems after Childhood Cancer: Precocious Puberty

Children treated for cancer may develop problems as a result of damage to the complex system of glands known as the endocrine system.

What is the endocrine system?

The endocrine system is a group of glands that regulate body functions including growth, puberty, energy level, urine production, and stress response. Glands of the endocrine system include the pituitary, hypothalamus, thyroid, adrenal, pancreas, ovaries (in females), and testes (in males). The hypothalamus and pituitary are sometimes called the “master glands” because they control many of the other glands in the endocrine system. Unfortunately, some treatments given for childhood cancer can damage the hypothalamus and pituitary gland, resulting in a variety of problems.



What are hormones?

Hormones are chemical messengers that carry information from the endocrine glands through the bloodstream. The endocrine system makes many hormones (such as growth hormone, sex hormones, adrenal and thyroid hormones) that maintain specific bodily functions.

What is the normal age for puberty to begin?

Puberty normally begins between the ages of 8 and 13 in girls, and 9 and 14 in boys. The timing of puberty is influenced by a person's genetic background, and the onset of puberty at a young age may run in families. Most girls begin to develop breasts and then pubic hair at around age 10 or 11. Menstrual periods usually start at around 12 to 13 years of age, but may occur earlier or later and still be normal. Boys usually begin to develop enlargement of the testicles and then pubic hair between 11 and 12 years of age.

What is precocious puberty?

Precocious puberty means having signs of puberty (such as pubic hair or breast growth) at an age younger than is normally expected. Most doctors agree that a girl has precocious puberty if she develops sexual traits earlier than age 8, and a boy has precocious puberty if he develops sexual traits prior to age 9.

The early release of hormones that causes precocious puberty also causes a growth spurt, with rapid bone growth. Early bone maturation results in less time for growth, so the child with precocious puberty will have a final adult height that is actually much shorter than normal.

What are the risk factors for developing precocious puberty?

Risk factors include:

- Radiation to the head or brain, especially doses of 18 Gy (1800 cGy/rads) or higher, including the following fields:
 - Head/brain (cranial)
 - Nasopharyngeal (area above the roof of the mouth)
 - Eye or eye socket (orbit)
 - Ear or infratemporal region (midfacial area behind the cheekbones)
- Female gender
- Younger age at the time of cancer treatment

Early puberty is also more common in overweight children.

Why does precocious puberty happen?

The hypothalamus and pituitary gland may be damaged after radiation treatments. The damage causes them to signal the ovaries (in girls) or testicles (in boys) to make female or male hormones at an earlier time. In other cases, signs of puberty occur early because of abnormalities in the ovaries, testicles or adrenal glands. Tests are done to learn if the cause of precocious puberty is in the brain or in another part of the body.

What screening is recommended?

All childhood cancer survivors should have a physical examination at least once a year, including measurement of height and weight, and evaluation of pubertal progress. If there are signs of accelerated growth or early puberty, a blood test to check sex hormones produced in the brain (FSH—follicle stimulating hormone; LH—luteinizing hormone), testes (testosterone) or ovaries (estradiol) may be done. Sometimes, an x-ray that measures the developmental age or maturation of bone (bone age) may also be done.

How is precocious puberty treated?

If a problem is detected, a referral should be made to an endocrinologist (doctor who specializes in hormone problems). Medications may be used to temporarily stop puberty and to decrease the rate of bone maturation. It is also important to evaluate and manage the psychological effects of beginning puberty too early. Although children with precocious puberty may have a mature physical appearance, their thoughts, emotions and behaviors are still that of their actual (chronological) age.

Written by Debra Kent, RN, MSN, CPNP, Cancer Survivorship Center, Cincinnati Children's Hospital Medical Center, Cincinnati, OH.

Reviewed by Lillian R. Meacham, MD; Priscilla Rieves, MS, RN, CPNP; Charles Sklar, MD; Julie Blatt, MD; Peggy Kulm, RN, MA; and Marcia Leonard RN, PNP.

Additional health information for childhood cancer survivors is available at
www.survivorshipguidelines.org

Note: Throughout this *Health Links* series, the term “childhood cancer” is used to designate pediatric cancers that may occur during childhood, adolescence, or young adulthood. Health Links are designed to provide health information for survivors of pediatric cancer, regardless of whether the cancer occurred during childhood, adolescence, or young adulthood.

Disclaimer and Notice of Proprietary Rights

Introduction to Late Effects Guidelines and Health Links: *The Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers* and accompanying *Health Links* were developed by the Children's Oncology Group as a collaborative effort of the Late Effects Committee and Nursing Discipline and are maintained and updated by the Children's Oncology Group's Long-Term Follow-Up Guidelines Core Committee and its associated Task Forces.

To cancer patients (if children, their parents or legal guardians): Please seek the advice of a physician or other qualified health provider with any questions you may have regarding a medical condition and do not rely on the Informational Content. The Children's Oncology Group is a research organization and does not provide individualized medical care or treatment.

To physicians and other healthcare providers: The Informational Content is not intended to replace your independent clinical judgment, medical advice, or to exclude other legitimate criteria for screening, health counseling, or intervention for specific complications of childhood cancer treatment. Neither is the Informational Content intended to exclude other reasonable alternative follow-up procedures. The Informational Content is provided as a courtesy, but not intended as a sole source of guidance in the evaluation of childhood cancer survivors. The Children's Oncology Group recognizes that specific patient care decisions are the prerogative of the patient, family, and healthcare provider.

No endorsement of any specific tests, products, or procedures is made by Informational Content, the Children's Oncology Group, or affiliated party or member of the Children's Oncology Group.

No Claim to Accuracy or Completeness: While the Children's Oncology Group has made every attempt to assure that the Informational Content is accurate and complete as of the date of publication, no warranty or representation, express or implied, is made as to the accuracy, reliability, completeness, relevance, or timeliness of such Informational Content.

No Liability on Part of Children's Oncology Group and Related Parties/Agreement to Indemnify and Hold Harmless the Children's Oncology Group and Related Parties: No liability is assumed by the Children's Oncology Group or any affiliated party or member thereof for damage resulting from the use, review, or access of the Informational Content. You agree to the following terms of indemnification: (i) “Indemnified Parties” include authors and contributors to the Informational Content, all officers, directors, representatives, employees, agents, and members of the Children's Oncology Group and affiliated organizations; (ii) by using, reviewing, or accessing the Informational Content, you agree, at your own expense, to indemnify, defend and hold harmless Indemnified Parties from any and all losses, liabilities, or damages (including attorneys' fees and costs) resulting from any and all claims, causes of action, suits, proceedings, or demands related to or arising out of use, review or access of the Informational Content.

Proprietary Rights: The Informational Content is subject to protection under the copyright law and other intellectual property law in the United States and worldwide. The Children's Oncology Group retains exclusive copyright and other right, title, and interest to the Informational Content and claims all intellectual property rights available under law. You hereby agree to help the Children's Oncology Group secure all copyright and intellectual property rights for the benefit of the Children's Oncology Group by taking additional action at a later time, action which could include signing consents and legal documents and limiting dissemination or reproduction of Informational Content.