

## THYROID PROBLEMS

Some people who were treated for cancer may develop endocrine (hormone) problems as a result of changes in the function of a complex system of glands known as the endocrine system.

### WHAT IS THE ENDOCRINE SYSTEM?

The endocrine system is a group of glands that regulate many body functions including growth, puberty, energy level, urine production, and stress response. Glands of the endocrine system include the pituitary, hypothalamus, thyroid, adrenals, 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 cancer can damage the endocrine system, resulting in a variety of problems.

### WHAT ARE HORMONES?

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

### WHAT IS THE THYROID GLAND?

The thyroid gland is located in the lower part of the neck in front of the windpipe. The gland makes two hormones, thyroxine (T<sub>4</sub>) and triiodothyronine (T<sub>3</sub>), that play an important role in growth and mental development, and help to regulate the body's metabolism. The thyroid gland is controlled by the pituitary, a gland in the brain that makes thyroid stimulating hormone (TSH). TSH is released from the pituitary in response to the levels of T<sub>4</sub> and T<sub>3</sub> in the blood. If the levels are low, the pituitary makes more TSH to signal the thyroid to increase the production of thyroid hormones. If T<sub>4</sub> and T<sub>3</sub> are high, the pituitary makes less TSH to signal the thyroid gland to slow down production.

### THE POSSIBLE LATE EFFECTS

Damage to the thyroid gland after cancer is usually the result of radiation to the head, brain or neck. This damage is usually very easy to treat, although it may not show up for years after treatment. Regular check-ups may help find thyroid problems early so that the proper treatment can be started. Several different types of thyroid problems may develop including an underactive thyroid (hypothyroidism), overactive thyroid (hyperthyroidism), and growths on the thyroid that may be benign (nodules) or malignant (cancer). Surgical

removal of the thyroid gland (thyroidectomy), radioiodine treatments (I-131 thyroid ablation), and high doses of MIBG (sometimes used in the treatment of neuroblastoma) may also result in low or absent levels of thyroid hormone, depending on the amount of thyroid tissue removed or destroyed.

Signs and symptoms of hypothyroidism may include:

- Feeling tired and listless
- Hoarse voice
- Problems concentrating
- Feeling sad/depressed
- Mood changes
- Constipation
- Weakness
- Feeling cold all of the time
- Puffiness around the eyes
- Slowing of normal growth
- Delayed onset of puberty
- Puffiness of the face and hands
- Weight gain
- Dry skin
- Brittle hair
- Muscle and joint aches
- Slowing of the heart rate
- Low blood pressure
- High cholesterol level
- Poor exercise tolerance

**Hyperthyroidism** occurs when the thyroid gland is too active. In this condition thyroid hormone levels are high and the body's metabolism speeds up. Signs and symptoms of hyperthyroidism may include:

- Jitteriness
- Anxiety
- Problems concentrating
- Feeling tired
- Muscle weakness
- Tremors
- Fast or irregular heartbeat
- Increased sweating
- Feeling hot all of the time
- Diarrhea
- Weight loss

- Irregular menstrual periods
- Bulging or protruding eyes
- Neck tenderness and swelling
- Poor exercise tolerance

**Thyroid nodules and thyroid cancer** are growths that may occur many years after radiation to the thyroid gland. Both usually begin as slow-growing, painless lumps in the neck. Most thyroid growths do not usually cause any symptoms.

#### WHO IS AT RISK FOR THYROID PROBLEMS?

People who received radiation that may have affected the thyroid gland directly are at risk for primary hypothyroidism, compensated hypothyroidism, thyroid nodules, and/or thyroid cancer. People who received radiation to the thyroid gland in high doses are also at risk for hyperthyroidism. The following radiation fields have the potential to affect the thyroid gland directly:

- Head/brain (cranial)
- Nose, mouth, and/or throat (nasopharyngeal, oropharyngeal)
- Neck (cervical, supraclavicular, mantle, or mini-mantle)
- Spine (cervical/neck portion)
- Total body irradiation (TBI)

In addition, people who received radioiodine therapy (I-131), high doses of MIBG, or had their thyroid gland surgically removed (thyroidectomy) are also at risk for primary hypothyroidism. People who received radiation that may have affected the pituitary gland in the brain are at risk for central hypothyroidism. Radiation in high doses to the following fields have the potential to affect the pituitary gland:

- Head/brain (cranial)
- Eye/orbit
- Ear/infratemporal region (midfacial area behind the cheekbones)
- Nose, mouth, and/or throat (nasopharyngeal, oropharyngeal)

Other factors that have been shown to increase the risk of thyroid problems after cancer include being:

- Female
- Treated with higher radiation doses
- Treated at a young age

Thyroid problems may occur soon after radiation, but generally do not occur until several years later. If treated promptly, thyroid problems are easily managed.

#### WHAT FOLLOW UP IS NEEDED FOR THOSE AT RISK?

Since thyroid problems may occur many years after cancer treatment, a yearly checkup is recommended for survivors who are at risk of developing thyroid problems. This checkup should include evaluation of growth in children and teens, examination of the thyroid gland, and a blood test to measure the levels of TSH and T<sub>4</sub>. During periods of rapid growth, healthcare providers may recommend more frequent monitoring of thyroid levels.

Female survivors at risk for thyroid problems who are planning to become pregnant should have their thyroid levels checked before attempting pregnancy. It is important to do this before becoming pregnant, because mothers with thyroid disease have a higher chance of having babies with developmental problems. It is also important to monitor thyroid levels periodically during pregnancy.

#### Works Cited

Adapted from Children's Oncology Group Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent, and Young Adult Cancers  
[www.survivorshipguidelines.org](http://www.survivorshipguidelines.org)