



Childhood Head & Neck Irradiation

WHAT IS THE THYROID GLAND?

The thyroid gland is a butterfly-shaped endocrine gland that is normally located in the lower front of the neck. The thyroid's job is to make thyroid hormones, which are secreted into the blood and then carried to every tissue in the body. Thyroid hormone helps the body use energy, stay warm and keep the brain, heart, muscles, and other organs working as they should.

EXPOSURE CONCERNS, DETECTION AND TREATMENT

The thyroid gland can be affected by exposure to radiation. The thyroid glands of children are especially sensitive to radiation, much more so than the thyroid gland of an adult.

CONCERNS

WHAT IS THE CONCERN ABOUT THE THYROID GLAND AND RADIATION?

The thyroid gland can be affected by exposure to radiation. The thyroid glands of children are especially sensitive to radiation, much more so than the thyroid gland of an adult. Radiation exposure appears to cause a number of different thyroid problems, including an underactive thyroid (hypothyroidism), thyroid nodules, and thyroid cancer. The younger the child is when the radiation exposure occurs, the greater is the risk of these problems occurring. If radiation exposure occurs when they are older than 20 years, their risk is the same as radiation exposure to adults. The risk of these thyroid problems is probably also greater with larger doses of radiation.

HOW CAN A CHILD BE EXPOSED TO RADIATION?

Radiation exposure can be accidental, or it can be part of medical treatment.

Accidental exposure has occurred with the release of radioactive iodine (I-131, see Radioactive Iodine brochure) during nuclear accidents, such as during the Russian Chernobyl nuclear power plant accident in 1986, or during atomic bomb testing (1951-1958, Marshall Islands; 1951-1970, Nevada Test Site). If you were a child in the time frame of atomic bomb testing at the Nevada Test Site, you can discover if you were potentially exposed to radiation at the following website: <http://ntsi131.nci.nih.gov/>.

Radiation therapy has been used in the past (1940-1960s) to treat benign conditions such as ring worm, enlarged thymus, enlarged tonsils, and enlarged lymph nodes. These types of medical treatments are no longer used. However, radiation therapy is still a very important part of the treatment of some types of childhood cancers, especially those involving the head and neck. These serious cancers include non-Hodgkin's lymphoma, Hodgkin's disease, acute lymphoblastic leukemia, rhabdomyosarcoma, neuroblastoma, nasopharyngeal carcinoma, and Ewing sarcoma. For all these cancers, the cancer cannot be completely treated without causing some radiation exposure to the thyroid gland.

SYMPTOMS

HOW LONG AFTER RADIATION EXPOSURE DO THYROID PROBLEMS OCCUR?

Hypothyroidism (see *Hypothyroidism brochure*).

An underactive thyroid can develop from a few months to many years after radiation therapy. However, it is most likely that this will occur 2-3 years after the treatment. This condition is effectively and easily treated with thyroid hormone.

Thyroid nodules (see *Thyroid Nodule brochure*)

- Thyroid nodules occur when there is a growth of thyroid cells into a lump within the thyroid gland. Thyroid nodules are usually noticed several years (typically 8-12 years) after radiation treatment. They can be detected by a physician when he/she



performs a physical examination of the neck and thyroid gland, or they can be seen using an ultrasound examination (picture of the thyroid gland obtained using sound waves). Thyroid cancer (see *Thyroid Cancer brochure*)

- Thyroid cancer may be found anywhere from 5 – 20 years after radiation treatment was given, although about 10 years after the treatment is the most common time. It can also be seen as late as 40-50 years after exposure.

CAN ADULTS BE AFFECTED BY RADIATION EXPOSURE?

While the adult thyroid gland is much less sensitive to radiation, it too may be affected, especially during radiation therapy for head and neck cancers. Hypothyroidism, thyroid nodules and thyroid cancer all can occur after radiation exposure in adults.

DETECTION

HOW CAN THYROID PROBLEMS BE DETECTED?

Hypothyroidism can be easily detected by a blood test. Patients may or may not have symptoms of an underactive thyroid.

Thyroid nodules can either be detected when a physician examines the thyroid gland by touch, or they can be detected using an ultrasound machine. Once a patient has been found to have a thyroid nodule, a physician will regularly re-examine the patient to see if the nodule has increased in size and/or may perform a fine needle aspiration biopsy of the nodule (see *Thyroid Nodule brochure*).

Thyroid cancer is more frequently found in thyroid nodules when the patient also had radiation exposure during childhood. Thyroid cancer may be found in about

15 – 35% of thyroid nodules that develop after radiation treatment or exposure during childhood. Thyroid cancer can be detected by a fine needle aspiration biopsy of thyroid cells from the nodule. This procedure is recommended for all thyroid nodules that can be felt on physical examination, nodules that increase in size, and certain other nodules with features that are worrisome.

TREATMENT

WHAT IS THE TREATMENT FOR THYROID PROBLEMS IN PATIENTS WHO HAVE RECEIVED RADIATION EXPOSURE AS CHILDREN?

Since thyroid problems may occur many years after the initial exposure, it is very important for an individual who has received radiation exposure as a child to have regular visits with a physician.

Hypothyroidism can be easily treated with thyroid hormone, exactly as hypothyroidism due to other causes is treated (see *Hypothyroidism brochure*).

Thyroid nodules in patients with childhood radiation exposure need to be monitored on a regular basis and many nodules require fine needle aspiration biopsy to make sure a thyroid cancer is not present (see *Thyroid Nodule brochure*).

If a thyroid cancer is found in a thyroid nodule of someone who was exposed to radiation as a child, the treatment is the same as any other patient found to have thyroid cancer (see *Thyroid Cancer brochure*). Usually thyroid surgery is a first step. Radioactive iodine may be necessary. Use of thyroid hormone treatment is always needed.

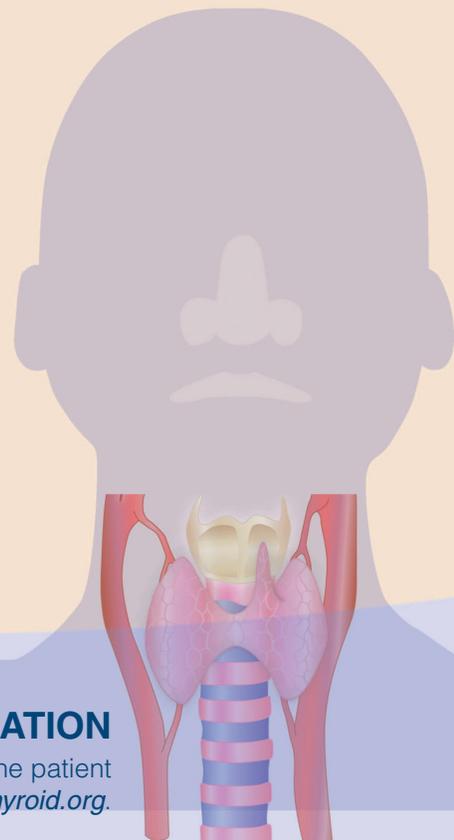
IS THYROID CANCER HARDER TO TREAT IN SOMEONE THAT HAS BEEN TREATED WITH RADIATION?

There is some evidence that thyroid cancer may have spread more by the time it is detected in patients who have had radiation treatment. However, the usual treatment for thyroid cancer is still very effective and survival rates are similar to patients that have not received radiation treatment.

MONITORING

HOW LONG SHOULD A PHYSICIAN FOLLOW SOMEONE WHO HAS HAD RADIATION TREATMENT?

Because thyroid problems can occur many years after the radiation therapy was given, life-long monitoring is recommended. If a patient develops hypothyroidism after radiation treatment they will need life-long treatment with thyroid hormone.



FURTHER INFORMATION

Further details on this and other thyroid-related topics are available in the patient information section on the American Thyroid Association website at www.thyroid.org.