

Radioactive Iodine Use For Thyroid Diseases

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1 THYROID GLAND & IODINE

The thyroid gland and iodine

Iodine is essential for proper function of the thyroid gland, which uses it to make the thyroid hormones. The thyroid is equipped with an active system or “pump” for moving iodine into its cells. Thyroid cancer cells usually take up iodine also, although they do not do this as well as normal thyroid cells. The ability of thyroid cells to take up iodine has been used by medical professionals to treat various thyroid diseases.

What is radioactive iodine (RAI)?

A radioactive isotope is a substance that gives off radiation. Iodine can be made into two radioactive isotopes for medical uses: I-123 and I-131. These isotopes can be given by mouth to patients with suspected thyroid conditions. RAI is then concentrated inside thyroid cells exactly like iodine and can be used to diagnose or treat thyroid problems. The radiation that RAI gives off can either be harmless to the thyroid cells (I-123) or the radiation may destroy the thyroid cells (I-131). RAI that is not concentrated in the thyroid gland is eliminated from the body through sweat and urine. RAI is safe to use in individuals who have had allergic reactions to seafood or X-ray contrast agents, since the allergic reaction is to the compound containing iodine, not the iodine itself.

RAI for thyroid imaging

I-123 is the isotope used to take pictures of the thyroid gland (*Thyroid Scan*). A very small “tracer” dose of I-123 is given to the patient, who then returns 3-6 h later so pictures of the thyroid gland can be taken using a camera that picks up the radiation emitted by the RAI. The camera is part of a machine that looks similar to an X-ray or CT scanning machine. In addition to getting the scan or picture, the amount of radiation being given off can also be counted to determine how active the thyroid gland is (*Radioactive Iodine Uptake, RAIU*). Since the radiation emitted by I-123 is harmless, no special precautions are necessary after a thyroid scan or RAIU. The total radiation dose that you receive during a thyroid scan is less than you would get if you had a routine chest X-ray. There are usually no side effects to I-123 given for thyroid imaging studies.

2 TREATMENT

RAI for treatment of thyroid disorders

I-131 is the isotope used to destroy both normal and cancerous thyroid tissue.

Normal Thyroid Tissue. Small doses of I-131 (5-30 millicuries, mCi) are given to destroy or “ablate” overactive thyroid tissue (see [Hyperthyroidism brochure](#)). This turns an overactive thyroid gland often time into an underactive thyroid gland. Doses of I-131 in the middle range (25-75 mCi) may be used to shrink large thyroid glands that are functioning normally but are causing problems because of their size. Patients can go home after the RAI treatment, although they are asked to follow some precautions (see below). It is common for patients to experience some pain in the thyroid after I-131 treatment for hyperthyroidism. Aspirin, ibuprofen or acetaminophen can treat this pain. The RAI treatment may take up to several months to have its effect.

Thyroid Cancer. Large doses of I-131 (30-200 mCi) are used to destroy thyroid cancer cells (see [Thyroid Cancer brochure](#)). If you are given a higher dose, you may be asked to stay isolated in a special room in the hospital for about 24 hours to avoid exposing other people to radiation, especially if there are small children living in the same home with you. The regulations that determine whether a patient needs to be isolated or can go home after the treatment are different in different states. Since the salivary glands weakly concentrate iodine, there may be pain and swelling of the salivary glands after high doses of I-131 therapy for thyroid cancer. This can be prevented or reduced by sucking on lemon drops after the therapy.

3 EXPOSURE

The chart on the following page outlines Iodine exposure to others after I-131 RAI treatment.

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EXPOSURE CONTINUED

Instructions to reduce exposure to others after I-131 RAI treatment

Action	Duration (days)
Delay return to work	1
Limit time in public places	1
Do not travel by airplane or public transportation	1
Do not travel on a prolonged automobile trip with others	2-3
Maintain prudent distances from others (~3 feet)	2-3
Drink plenty of fluids	2-3
Do not prepare food for others	2-3
Do not share utensils with other	2-3
Flush the toilet 2-3 times after use	2-3
Sleep in a separate bed (~7 feet of separation)	5-11*
Avoid prolonged close contact with children and pregnant women	5-11*

*duration depends on dose of I-131 given

4 RISKS & CONCERNS

Precautions after treatment with I-131 RAI

Since I-131 RAI produces radiation, patients must do their best to avoid radiation exposure to others, particularly to pregnant women and small children. Therefore, there are certain precautions that patients who have been treated with RAI are expected to follow after their treatment. These guidelines comply with the Nuclear Regulatory Commission and will be reviewed with patients by the medical institutions giving their treatment. Importantly, the amount of radiation exposure markedly decreases as the distance from patients increases. Patients who need to travel in the time immediately after I-131 RAI treatment are advised to carry a letter of explanation from their physician. This is because radiation detection devices used at airports or in federal buildings may pick up even radiation levels thought to be safe.

Long term risks of I-131 RAI

In general, RAI is a safe and effective treatment for the thyroid disorders mentioned above. When RAI is used as treatment for hyperthyroidism, it is difficult to avoid development of hypothyroidism. Hypothyroidism is therefore watched for, and quickly treated with thyroid hormone. Temporary worsening of hyperthyroidism can also occur. There may be a small increase in the risk of developing thyroid cancers after RAI treatment for hyperthyroidism, although this has not been seen in all studies. Importantly, once you have been treated with RAI, you still need to have regular exams by your physician for the rest of your life.

Doses of RAI used to treat thyroid cancer can cause permanent problems with the salivary glands leading to loss of taste and dry mouth. However, precautions are taken to try and prevent this (ie using lemon drops). Temporary or permanent decreases in blood cell counts can also occur.

Special concerns for women

RAI, whether I-123 or I-131, should never be used in a patient who is pregnant or nursing. RAI given during pregnancy can damage the baby's thyroid gland. RAI given to a woman who is nursing can get into breast milk and therefore reach the baby. Also, pregnancy should be put off until at least 6 - 12 months after I-131 RAI treatment, since the ovaries are exposed to radiation after the treatment. Women who have not yet reached menopause are asked to fully discuss these precautions about use of RAI with their physician. There is no clear evidence that RAI leads to infertility.

Special concerns for men

Men who receive RAI treatment for thyroid cancer may have decreased sperm counts and temporary infertility for periods of roughly two years. A physician may discuss sperm banking with a male patient who is expected to need several doses of RAI for thyroid cancer.

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