



THYROID CANCER

¹³¹I Therapy Surprisingly Is Kept In The Body Longer In Patients Treated With Furosemide And Potassium Chloride Than In A Control Group

WHAT IS THE STUDY ABOUT?

In most patients with thyroid cancer, surgery is performed to remove the cancer and the entire thyroid tissue. After surgery, most thyroid cancer patients are treated with radioactive iodine (I-131, RAI) to destroy any remaining thyroid cells, both normal and cancerous. I-131 works because it is taken up by the normal and cancerous thyroid cells and, once inside, the radiation produced by the I-131 destroys the cell. I-131 is very effective because thyroid cells are the only cells in the body that actively take up and concentrate iodine. Some cells, such as those that make of the salivary glands, also can take up iodine but, because it is not concentrated within the cell, the I-131 radiation usually does not severely damage the cell. Only a small fraction of the total dose used to treat a patient is actually taken up by the thyroid cells, with the rest removed from the body, mainly through the urine. However, because the I-131 circulates in the blood before it is removed from the body, the whole body is exposed to the I-131 radiation to some degree. The aim of the I-131 therapy is to achieve the highest radiation dose in thyroid tissue to destroy both remaining normal and cancerous thyroid cells with the lowest possible radiation exposure to the rest of the body. In order for the RAI to be effective, the patient's TSH levels need to be increased to stimulate both the normal and cancerous thyroid cells to take up the I-131 and be destroyed. When the TSH levels are increased by withdrawing patients from thyroid hormone and making them hypothyroid, patients tend to hold onto fluid and the flow of urine through the kidneys is decreased. In an attempt to reduce the whole body radiation in these patients, some physicians use water pills (diuretics) to increase the flow of urine from the kidneys and, hopefully, hasten the removal of I-131 from the body. This study was done to determine if diuretics are useful in reducing the whole body radiation produced by I-131 in patients with thyroid cancer.

THE FULL ARTICLE TITLE

Matovic MD, Jankovic SM, Jeremic M, Tasic Z, Vlajkovic M. Whole-body radioiodine retention 72 hours after I-131 therapy is paradoxically higher in patients treated with furosemide and potassium chloride than in control group. *Thyroid* 2009;19:843-8.

WHAT WAS THE AIM OF THE STUDY?

The aim of this study is to determine the usefulness of diuretics in reducing the whole body radiation in patients with thyroid cancer receiving I-131 therapy.

WHO WAS STUDIED?

A total of 43 patients with thyroid cancer treated with I-131 in the Department of Nuclear Medicine at the Clinical Center in Kragujevac, Serbia, from September 2007 through September 2008. All patients were withdrawn from thyroid hormone before receiving the I-131 therapy.

HOW WAS THE STUDY DONE?

The patients were divided in 2 groups:

Furosemide — the 23 patients in this group received 20 mg of the diuretic furosemide 3 hours after the administration of the I-131. In addition to increasing the removal of fluid from the body, potassium is also lost after furosemide therapy. To replace the potassium lost, all patients in this group received 250 mg of potassium chloride every 8 hours for the next 3 days.

Control — the 20 patients in this group received neither furosemide nor potassium chloride.

The radiation exposure to the patients was measured three ways:

- 1) All patients collected their urine after I-131 treatment to measure the excretion of I-131,
- 2) Whole body radiation measurements were performed immediately after the I-131 treatment and 72 hours later.
- 3) Blood samples were collected 72 hours after the I-131 treatment to measure the radiation exposure to the blood.

WHAT WERE THE RESULTS OF THE STUDY?

Surprisingly, the amount of I-131 retained in the body after the I-131 treatment was 1.6 times higher in the furosemide group as compared to controls without furosemide. Patients taking furosemide also had significantly lower removal of I-131 in the urine over 72 hours and the blood radioactivity was almost 3 times higher as compared to controls.

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THYROID CANCER, continued

HOW DOES THIS COMPARE WITH OTHER STUDIES?

Several studies have looked at the use of diuretics to increase the radioactivity excretion after I-131 treatment. A few studies showed that diuretics did increase the elimination of I-131 in the urine. However, the present study found the opposite, with decreased elimination of I-131 in the urine and higher whole body radiation. Interestingly, in all these studies, THW was used to prepare patients for I-131 therapy, which may cause decreased elimination of I-131 in the urine due to hypothyroidism.

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

In patients with thyroid cancer receiving I-131 after THW, diuretics surprisingly increased the whole body

radiation rather than decreasing it, which was expected. Because of this, it is not recommended to use these medications after I-131 therapy. The decreased elimination of I-131 in the urine due to hypothyroidism could possibly be avoided by increasing the patients TSH level with rhTSH before I-131 instead.

— Jamshid Farahati, MD

ATA THYROID BROCHURE LINKS

Thyroid cancer: http://thyroid.org/patients/patient_brochures/cancer_of_thyroid.html

Radioactive Iodine Therapy: http://thyroid.org/patients/patient_brochures/radioactive.html

ABBREVIATIONS AND DEFINITIONS

Radioactive iodine (RAI): this plays a valuable role in diagnosing and treating thyroid problems since it is taken up only by the thyroid gland. I-131 is the destructive form used to destroy thyroid tissue in the treatment of thyroid cancer and with an overactive thyroid. I-123 is the non-destructive form that does not damage the thyroid and is used in scans to take pictures of the thyroid (Thyroid Scan) or to take pictures of the whole body to look for thyroid cancer (Whole Body Scan).

Furosemide: is a water pill (diuretic). Diuretics decrease the body fluid by allowing the kidneys to get rid of unneeded water and salt from the body into the urine.

TSH: Thyroid stimulating hormone – produced by the pituitary gland that regulates thyroid function; also

the best screening test to determine if the thyroid is functioning normally.

Recombinant human TSH (rhTSH): human TSH that is produced in the laboratory and used to produce high levels of TSH in patients after an intramuscular injection. This is mainly used in thyroid cancer patients before treating with radioactive iodine or performing a whole body scan. The brand name for rhTSH is Thyrogen™.

Thyroid Hormone Withdrawal (THW): this is used to produce high levels of TSH in patients by stopping thyroid hormone pills and causing short-term hypothyroidism. This is mainly used in thyroid cancer patients before treating with radioactive iodine or performing a whole body scan.