



PEDIATRIC THYROID CANCER

Postoperative TSH-stimulated thyroglobulin may predict outcome of thyroid cancer in children

BACKGROUND

While much less common, children can develop thyroid cancer. Fortunately, most children who develop thyroid cancer have an excellent outcome. This is true even if the cancer has spread outside the thyroid and into the lungs. As with adults, treatment with radioactive iodine is indicated when there is persistent thyroid cancer after the initial surgery. In order to treat with radioactive iodine, the remaining thyroid tissue, including any remaining cancer, needs to be stimulated by TSH, either by stopping the thyroid hormone and having the patient become hypothyroid or by treating with Thyrogen™. In adults, the level of the thyroid-specific protein thyroglobulin prior to this stimulation helps predict how the patient will do long term. This data does not exist in children. This study was performed to look at how a stimulated thyroglobulin level prior to radioactive iodine therapy predicts outcomes for pediatric thyroid cancer patients.

THE FULL ARTICLE TITLE

Liu L et al 2020 Prognostic value of pre-ablation stimulated thyroglobulin in children and adolescents with differentiated thyroid cancer. *Thyroid*. Epub 2020 Jan 22. PMID: 31964278.

SUMMARY OF THE STUDY

The cases of thyroid cancer in patients under the age of 21 who were treated at one academic medical center in China were evaluated over a 9-year period. All the children had a total thyroidectomy and a central lymph node dissection as well as a lateral lymph node dissection if abnormal lymph nodes were seen on imaging prior to surgery. Patients were prepared for radioactive iodine therapy by stopping the thyroid hormone, causing the TSH to increase and having the patient become hypothyroid. Thyroglobulin and thyroglobulin antibody levels were measured under this TSH stimulation, prior to radioactive iodine therapy and those with positive thyroglobulin antibodies were excluded from the study. Patients were categorized by the American Thyroid Association (ATA) pediatric thyroid cancer risk categories and followed with testing every 6 to

12 months. Their response to treatment was determined by thyroglobulin testing and radiology imaging studies and they were defined as either having no disease or with evidence of thyroid cancer at their last follow up. The primary result was the level of thyroglobulin before radioactive iodine therapy as related to both evidence of thyroid cancer at the last follow up visit and the ATA pediatric risk category.

There were 118 patients age 5-20 with an average age of 16 in the study. All had a total thyroidectomy and all had lymph nodes removed from the central part of the neck. In addition, ~2/3rds of the patients had a lateral neck lymph node dissection. The majority had classic papillary thyroid cancer. About 1/4 of patients had spread of the cancer to the lungs. The average follow up was just over 5 years.

The stimulated thyroglobulin before radioactive iodine therapy was an average of 15.1 ng/ml with a range of <1 to > 4000 ng/ml. Those who had no evidence of their cancer at the end of the study had an average stimulated thyroglobulin level of 4.82 ng/ml while the stimulated thyroglobulin level was an average of 184.1 ng/ml in those with those with persistent thyroid cancer. A stimulated thyroglobulin level of 17.8 or less was predictive of no evidence of cancer in follow up evaluations almost 9 out of 10 times. In patients who were classified as having high risk cancer based on the initial thyroid cancer pathology and staging, a stimulated thyroglobulin level of 17.8 ng/ml or less had a much lower incidence of persistent cancer (5.6% compared to > 90% if the level was > 17.8 ng/ml).

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

Stimulated thyroglobulin levels prior to radioactive iodine therapy help predict clinical outcomes in pediatric thyroid cancer patients. A lower stimulated thyroglobulin level, even in high risk disease, predicts a high likelihood of a good outcome after at least 5 years of follow up. This is





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important to these patients and their parents as it can provide comfort for those with lower risk disease and low stimulated thyroglobulin levels. It is also useful for clinicians to have a sense of the likelihood of persistent

cancer and the intensity of follow up testing needed for pediatric thyroid cancer patients.

— Joshua Klopper, MD

ATA THYROID BROCHURE LINKS

Thyroid Cancer (Papillary and Follicular): <https://www.thyroid.org/thyroid-cancer/>

Radioactive Iodine Therapy: <https://www.thyroid.org/radioactive-iodine/>

Thyroid Surgery: <https://www.thyroid.org/thyroid-surgery/>

ABBREVIATIONS & DEFINITIONS

Thyroidectomy: surgery to remove the entire thyroid gland. When the entire thyroid is removed it is termed a *total thyroidectomy*. When less is removed, such as in removal of a lobe, it is termed a *partial thyroidectomy*.

Total thyroidectomy: surgery to remove the entire thyroid gland.

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.

Thyroglobulin antibodies: these are antibodies that attack the thyroid instead of bacteria and viruses, they are a marker for autoimmune thyroid disease, which is the main underlying cause for hypothyroidism and hyperthyroidism in the United States.

Thyroglobulin: a protein made only by thyroid cells, both normal and cancerous. When all normal thyroid tissue is destroyed after radioactive iodine therapy in patients with thyroid cancer, thyroglobulin can be used as a thyroid cancer marker in patients that do not have thyroglobulin antibodies.

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*).

Thyroid Hormone Withdrawal: 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.

Stimulated thyroglobulin testing: this test is used to measure whether there is any cancer present in a patient that has previously been treated with surgery and radioactive iodine. TSH levels are increased, either by withdrawing the patient from thyroid hormone or treating the patient with recombinant human TSH, then levels of thyroglobulin are measured. Sometimes this test is combined with a whole body iodine scan.

Lymph node: bean-shaped organ that plays a role in removing what the body considers harmful, such as infections and cancer cells.

Central neck compartment: the central portion of the neck between the hyoid bone above, and the sternum and collar bones below and laterally limited by the carotid arteries.