CLINICAL THYROIDOLOGY **FOR PATIENTS**

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THYROID FUNCTION TESTS

Is serum TSH the best measure for levothyroxine treatment in hypothyroid patients?

BACKGROUND

Thyroid stimulating hormone (TSH) is a hormone produced by the pituitary gland and released into the circulation. TSH binds to thyroid cells to stimulate the production and secretion of the thyroid hormones T_4 and T3. When thyroid hormone levels are low, TSH secretion is increased and stimulates the thyroid to produce and secrete more T_4 and T_3. When thyroid hormone levels are high, TSH secretion is decreased and T_4 and T_3 fall. In patients with hypothyroidism, TSH is thought to be the most sensitive test to guide thyroid hormone treatment. Recent studies have questioned whether monitoring thyroid hormone treatment with TSH alone is adequate. The aim of this study was to compare serum T_4 and T_3 levels in hypothyroid patients treated with thyroid hormone to those in untreated patients.

THE FULL ARTICLE TITLE

Hoermann R et al. Is pituitary thyrotropin an adequate measure of thyroid hormone-controlled homeostasis during thyroxine treatment? Eur J Endocrinol. November 26, 2012 [Epub ahead of print].

SUMMARY OF THE STUDY

The study included 1994 patients seen in a thyroid clinic between October 2006 and January 2007. The majority of patients were women and the average age was 61 years. There were 785 hypothyroid patients who were taking between 50 to 200 µg of levothyroxine daily. These patients were compared with 1159 patients who were not treated with thyroid hormone. The cause of hypothyroidism was thyroid surgery or radioactive iodine treatment in most patients as only 1/3 of these patients had Hashimoto's thyroiditis. Serum T_3 levels were lower in hypothyroid patients taking levothyroxine as compared to those of untreated patients at that same TSH level. Serum T_4 levels were lower in control subjects than in levothyroxine-treated subjects for a similar TSH level. Based on a complex mathematical program, the authors postulated that in hypothyroid patients treated with levothyroxine there is increased conversion of T_4 to T_3 within the pituitary but decreased conversion of T_4 to T_3 in the rest of the body. Therefore, some hypothyroid patients treated with levothyroxine who have TSH within normal range will have T_3 levels below the normal range of healthy individuals. The authors concluded that in hypothyroid patients undergoing levothyroxine treatment, TSH cannot be considered to be the gold standard of adequate replacement.

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

The authors suggest that TSH is not the best measure of thyroid hormone replacement in hypothyroid patients. A major limitation to the study is that their analysis is based on mathematical models as opposed to actual data. Certainly there are patients who have low T_3 levels despite normal T_4 and TSH levels. In these patients, adding a T_3 preparation to levothyroxine therapy may be indicated, especially if they continue to have hypothyroid symptoms on their own. However, it appears that levothyroxine therapy alone is sufficient for most hypothyroid patients.

— Alina Gavrila, MD, MMSC

ATA THYROID BROCHURE LINKS

Hypothyroidism: http://www.thyroid.org/what-is-hypothyroidism

Thyroid Hormone Treatment: http://www.thyroid.org/thyroid-hormone-treatment

Thyroid Function Tests: http://www.thyroid.org/blood-test-for-thyroid

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THYROID FUNCTION TESTS, continued

ABBREVIATIONS & DEFINITIONS

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.

Pituitary gland: this endocrine gland sits at the base of the brain and secretes hormones that control thyroid and adrenal function, growth and reproduction. The pituitary gland secretes TSH to control thyroid function.

Thyroxine (T_4): the major hormone produced by the thyroid gland and available in pill form as Levoxyl™, Synthroid™, Levothroid™ and generic preparations. T_4 gets converted to the active hormone T_3 in various tissues in the body.

Triiodothyronine (T_3): the active thyroid hormone, usually produced from thyroxine, available in pill form as Cytomel™.

Hypothyroidism: a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

Thyroid hormone therapy: patients with hypothyroidism are most often treated with Levothyroxine in order to return their thyroid hormone levels to normal. Replacement therapy means the goal is a TSH in the normal range and is the usual therapy.

Hashimoto's thyroiditis: the most common cause of hypothyroidism in the United States. This represents an autoimmune disease and it is caused by antibodies that attack and destroy the thyroid.

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 an overactive thyroid.