CLINICAL **THYROIDOLOGY** FOR THE **PUBLIC**

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HYPOTHYROIDISM

Metabolic parameters in euthyroid and hypothyroid women on levothyroxine are different

BACKGROUND

It is known that long-term suppression of TSH with levothyroxine leads to bone loss and has negative cardiac effects, but metabolic function changes of thyroid hormone replacement are not widely understood. Metabolism is measured by determining the resting energy expenditure (REE). It is thought that doses of thyroid hormone more than required for maintaining a normal TSH may increase metabolism, REE and food intake and decrease lean body mass. Indeed, previous studies have shown that REE was higher in patients on TSH suppressive doses of thyroid hormone but these studies were done for short time frames, and some used T_3 replacement or combination T_4/T_3 rather than T_4 alone.

This study was done to be more thorough in its measurements and estimates of energy expenditure. It also compared 3 groups: healthy controls, hypothyroid women on typical levothyroxine doses, and hypothyroid women on suppressive doses of levothyroxine.

This study was done to find if levothyroxine doses high enough to suppress TSH lead to metabolic changes in body composition or energy expenditure.

THE FULL ARTICLE TITLE

Samuels MH et al. Effects of levothyroxine replacement or suppressive therapy on energy expenditure and body composition. Thyroid. December 23, 2015 (Epub ahead of print).

SUMMARY OF THE STUDY

A total of 26 women on suppressive levothyroxine doses, 80 women on long-term levothyroxine replacement therapy with normal TSH levels and 16 euthyroid women not on levothyroxine were evaluated. The TSH-suppressive group was comprised of women treated for low risk thyroid cancer who were without evidence of disease (16) and women were over-treated for hypothyroidism after radioactive iodine therapy (5) or for primary hypothyroidism (5). The replacement group consisted of women hypothyroid due to primary hypothyroidism (62), primary hypothyroidism plus lobectomy for benign reasons (4), post-radioactiveiodine hypothyroidism for Grave's disease (9), post-partum thyroiditis followed by permanent hypothyroidism (3), or thyroidectomy for nodular goiter or very low risk thyroid cancer (2). The healthy group was comprised of 16 healthy women without thyroid nodules or thyroid dysfunction.

The three groups were similar in age (39-41 years old) and BMI (average 25-27 years old). The TSH was similar in the healthy control group and the hypothyroid group on usual replacement (2.13 vs 2.08). The TSH was lower in the suppressive group (0.14 +/- 0.02). Free T_4 was highest in the suppressive TSH group, with the next highest levels in the euthyroid replacement group, then lowest in the normal controls. The free T_3 values were similar in the suppressive TSH group and the normal controls, and lower in the euthyroid replacement group. Body composition (including lean body mass, fat mass, % fat mass) was not different in the three groups. Dietary intake and physical activity were also the same in all groups. However, REE was lower by 6% in the levothyroxine group with normal TSH values than the suppressive TSH group and 4% lower than normal controls. The REE correlated with free T_3 levels, but not TSH or free T_4 values.

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

Women on suppressive doses of levothyroxine have similar metabolic profiles to healthy controls. There was no lean muscle mass loss, fat loss, or higher REE with higher than physiologic doses of thyroid hormone. No positive or negative effects on body composition were noted in women on suppressive doses of levothyroxine alone.

The study raises more questions about REE in patients with normal TSH values on levothyroxine replacement. REE was slightly lower in this group, but this group did not have different levels of BMI or body composition, reassuringly. However, the free T_3 levels were lower, which may raise further questions about using T_3 in combination with free T_4. It should be noted that previous studies of combination therapy (T_4 plus T_3) have not shown any

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differences in weight from LT_4 monotherapy. More studies will be helpful to determine risks and benefits before combination therapy can be widely accepted.

— Julie Hallanger Johnson, MD

ATA THYROID BROCHURE LINKS

Thyroid and Weight: http://www.thyroid.org/thyroid-and-weight/

ABBREVIATIONS & DEFINITIONS

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. Suppressive therapy means that the goal is a TSH below the normal range and is used in thyroid cancer patients to prevent growth of any remaining cancer cells.

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.

Thyroxine (T_4): the major hormone produced by the thyroid gland. 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™.

Levothyroxine (T_4): the major hormone produced by the thyroid gland and available in pill form as Synthroid™, Levoxyl™, Tyrosint™ and generic preparations.

Resting energy expenditure (REE): general procedure done to measure metabolism and metabolic rate

Body Composition: The human body is composed of fat mass, muscle mass (lean body mass) and bone mass. Total body water is included in the measurements of muscle mass.