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Cognitive Performance and Mood Changes in the Post-thyroidectomy Patient Treated with T4 versus T4+T3
Lorena Likaj, MPH

Abstract
This study investigated changes in cognition and mood in the post-thyroidectomy patient. Specifically, this study investigates changes in cognition and mood, when the patient has been returned to normal, laboratory serum thyroid-stimulating hormone (TSH) reference levels, following conventional thyroid hormone replacement therapies with levothyroxine (T4) alone. Findings reveal a distinct, small, and clinically significant subgroup of post-thyroidectomy patients (10–15%) who continue to experience impaired cognition and mood, even when routinely measured serum TSH levels have been returned to normal levels. Findings are discussed within a conceptual matrix emphasizing the differential role of deiodinase enzymes required for conversion of T4 to T3 within the brain (Type II), compared to T4 to T3 conversion completed in peripheral tissues.

Problem
Many patients with hypothyroidism, induced by a complete thyroidectomy, develop depression, decrease in cognitive function, and other psychiatric symptoms. These symptoms are reversed with thyroxine (T4) replacement therapy.

In these patients, the standard of treatment is daily administration of levothyroxine, a synthetic form of thyroxine (T4). The administration of T4 replaces the low levels of T4 resulting from the surgical destruction of the thyroid gland. The administered T4 is then converted to T3 peripherally and in the brain through deiodinase type II polymorphism (threonine to alanine) which predicts L-thyroxine dose to achieve target thyroid hormone levels in hypothyroid patients.

Research Questions
1. Do post-thyroidectomy patients, who have been returned to normal thyroid stimulating hormone levels, by way of conventional hormone replacement therapies, continue to experience impairments in cognition and mood?
2. Can differences in the post-thyroidectomy patients, who continue to experience impaired cognition and mood, be explained by the hormone replacement therapy intervention, T4 alone versus T4 in combination with T3?
3. Does review, summary, and critical analysis of the professional medical literature, from the period 1985–2015, support a proposed new model, emphasizing down regulation of deiodinase enzymes type II in brain, as potentially causal in explaining differences between post-thyroidectomy patients who’s cognition and mood improves with conventional hormone replacement therapies (80-85%) and post-thyroidectomy patients, who fail to demonstrate significant improvements in cognition and mood?

Purpose
The purpose of this study is to investigate changes in mood and cognitive function in post thyroidectomy patients. The reason this study is important is because there are few studies that investigate treatment of hypothyroidism in the post thyroidectomy patient.

Social Change Implications
This study proposes a new model, based upon down regulation of enzymes responsible for the conversion of T4 into T3. This model has the following social change implications:
1. Improve the medical management of post-thyroidectomy patients.
2. Improve the quality of life and standard of living of post-thyroidectomy patients and their families.