Hyperthyroidism following the ingestion of natural health products

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Natural health products continue to gain popularity in Canada.[1] However, these supplements can be associated with adverse side effects. In this case, we describe a woman who developed severe hyperthyroidism following the ingestion of natural health products containing iodine. Although international studies typically describe this phenomenon in patients with Graves disease, multinodular or iodine deficiency goitre, and Hashimoto thyroiditis,[2-4] this case was unusual, as our patient had no underlying thyroid disease. We illustrate the importance of knowledge of supplement use and the potential complications that can arise following supplement ingestion.

Case

A 60-year-old Canadian-born woman presented with increasing anxiety, frequent bowel movements, and a 9-kg weight loss. She had a history of hypertension and irritable bowel syndrome. She had been taking 12.5 mg/d of hydrochlorothiazide for 10 years. She had no family history of thyroid or autoimmune disease.

Three years previously, her naturopath had prescribed her 12.5 mg/d of "iodine complex" (5 mg of molecular iodine and 7.5 mg of potassium iodide) for her general health. She was also encouraged to consume exogenous iodine through a red algae seaweed product. Additionally, she routinely consumed a B vitamin complex containing 167 µg of biotin to encourage hair health.

On examination, her weight was 85 kg, her blood pressure was 159/77 mm Hg, and her pulse was 110 beats/min. She appeared mildly anxious. Her thyroid gland felt minimally enlarged, with no nodules palpable. She had no ophthalmopathy. She had a fine tremor in her hands bilaterally. Her thyroid-stimulating hormone (TSH) level was less than 0.01 mIU/L, her free thyroxine (fT_4) level was 57 pmol/L (reference range 12 to 22 pmol/L), and her free triiodothyronine (fT_3) level was 18.2 pmol/L (reference range 3.4 to 5.9 pmol/L).

The patient initially elected to see her naturopath for treatment. Her iodine complex was discontinued but she was advised to start taking a preparation of 4% organic lemon balm polyphenol, 5% bugleweed polyphenol, and rosemary extract[5] and a preparation of ferrous iodide and potassium iodide for her symptoms.[6]

As she felt increasingly unwell, she then presented to her family physician for review. Her TSH level was measured again and was less than 0.01 mIU/L, and her fT_4 and fT_3 levels had increased to 90 pmol/L and 19.9 pmol/L, respectively. Her family physician promptly discontinued all her natural health supplements and initiated propranolol and methimazole.

On further investigation, findings of an ultrasound were normal. Her level of TSH-binding inhibitory immunoglobulins (TBII) was slightly elevated at 4.6 IU/L (reference range 0.0 to 1.9 IU/L). She had a radioactive iodine uptake scan (iodine 123 uptake scintigraphy) 4 months after stopping her supplements, findings of which showed a low iodine uptake of 4.9%.

Over the next several months her symptoms improved. Her methimazole and propranolol were tapered. Currently, she is no longer taking antithyroid medications or natural supplements and she remains clinically and biochemically euthyroid.

Discussion

Iodine is critical to normal thyroid function. It is taken up by transporters on thyroid cells and used to synthesize iodotyrosines, which form fT_4 and fT_3.[7] To maintain normal thyroid function, the recommended daily intake of iodine for adults is 150 µg/d, with an upper limit of 1100 µg/d.[8]

With exposure to increasing amounts of iodine (eg, through the ingestion of supplements or iodine-containing contrast), the thyroid has intrinsic regulatory mechanisms in place to maintain normal thyroid function. The Wolff-Chaikoff effect describes the immediate intrinsic reduction

Editor's key points

- Patients with and without underlying thyroid disease can be at risk of thyroid dysfunction after exposure to excess iodine (eg, by taking iodine-containing natural health supplements).
- Although excess intake of iodine has been reported to cause hyperthyroidism in patients with Graves disease, multinodular or iodine deficiency goitre, and Hashimoto thyroiditis, iodine-induced hyperthyroidism has been less often described in patients without thyroid disease.
- As the use of natural health products continues to gain popularity in Canada, health care professionals should be aware of the risks of natural health supplements and ensure that they ask patients about their consumption of these products.

in thyroid hormone synthesis following a large iodine load, mainly due to impaired organification of iodide.[7] This effect is typically transient, lasting only a few days in healthy individuals.[8] Those with a history of thyroid disease (eg, Graves disease, Hashimoto thyroiditis) can be more susceptible to the Wolff-Chaikoff effect, and hypothyroidism can ensue after iodine exposure.

Iodine exposure can also lead to hyperthyroidism (Jod-Basedow phenomenon),[7] as in the current case. This phenomenon is classically described in individuals who live in iodine-deficient regions,[2] but it has also been described in those with a history of Graves disease, multinodular goitre, and thyroiditis.[3,8] In a case series from the United States, patients with a history of Graves disease and Hashimoto thyroiditis developed hyperthyroidism after taking over-the-counter iodine supplements.[4] In another case, a 39-year-old German woman with a history of goitre developed hyperthyroidism after consuming an herbal tea containing kelp for 4 weeks.[3]

In the current case, our patient had no known history of thyroid disease. Findings of a thyroid ultrasound were normal, and her levels of anti–thyroperoxidase antibodies were normal. Although her level of TBII antibodies was slightly elevated, she had no clinical features of Graves disease. Findings of her radioactive iodine uptake scan showed low uptake, suggestive of thyroiditis. Although exogenous iodine can lead to findings of low uptake on scans, she had not taken iodine in 4 months.

Iodine-induced hyperthyroidism has been less often described in patients without thyroid disease. A 45-year-old woman in Italy who had no underlying thyroid disease developed thyroiditis shortly after starting a kelp-containing diet. Unlike in our case, her hyperthyroidism persisted for 2 months, followed by hypothyroidism and then resolution.[9] A 72-year-old woman without thyroid disease from the United States also presented with hyperthyroidism after ingestion of kelp tablets during the previous year. As in our case, her thyroid function normalized upon stopping the tablets.[10] In Israel, a 27-year-old-woman presented with hyperthyroidism after ingesting kelp-containing supplements. She also had no known history of thyroid disease. Seven weeks after discontinuing her supplements, her thyroid function also normalized.[11]

An additional complexity was that our patient was taking biotin (often marketed as vitamin B7 or vitamin H) for hair and skin health, fatigue, and low energy. Although her biotin dose was low and likely did not unduly influence her test results, high doses of biotin can interfere with endocrine testing, including thyroid function tests. Supraphysiologic doses of biotin are being increasingly promoted as a remedy for poor hair and skin health, fatigue, and low energy.[12] Biotin, however, can interfere with endocrine testing, including thyroid function tests. The type of interference can vary depending on the immunoassays used, but most often high-dose exposure (usually >1.5 mg/d) leads to a false depression of TSH level and a false elevation of fT_3 and fT_4 levels (ie, it mimics hyperthyroidism).[12] Biotin can also cause a false-positive elevation of TBII levels and false reduction in thyroglobulin levels. Patients are typically advised to withhold biotin-containing supplements for 48 hours before thyroid function testing.[12]

Conclusion

We describe a healthy woman with no underlying thyroid disease who developed hyperthyroidism following the ingestion of iodine-containing natural health supplements. As the use of natural health products continues to gain popularity in Canada (73% of Canadians reported taking natural health products regularly),[1,13] it is important for health care providers to ask all patients specifically about their use of these products. Many patients do not consider supplements as medications worth reporting to their physicians.[12] Health care practitioners should also be aware of the content of supplements and be cognizant of related side effects.

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Competing interests
Dr Clemens received a 2017 Diabetes Canada Junior Investigator Award sponsored by AstraZeneca that was unrelated to this work, and she has attended conferences supported by Merck Inc.

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