A 13-Year-Old Boy with Persistent Emesis

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A previously healthy 13-year-old boy presented to the emergency department with a 1-month history of multiple episodes of emesis daily accompanied by a 20-pound weight loss during that period. The patient reports that he was in his usual state of health until approximately 1 month prior, when he began to feel light-headed and dizzy. A few days later, he began to have non-bloody, non-bilious, post-prandial emesis following intake of both solids and liquids. Prior to each bout of emesis, the patient reports a frontal, pounding headache that is accompanied by palpitations, jitteriness, and white spots in his visual fields. These associated symptoms are usually relieved with emesis. The patient was seen by his primary care physician several weeks prior and diagnosed with gastroenteritis. He was given a trial of ranitidine, but that did not relieve his symptoms. He reported that the symptoms progressively worsened over the course of the month to three to four times daily, prompting his mother to bring him to the emergency room. Review of systems was negative for fevers, chills, night sweats, shortness of breath, chest or abdominal pain, change in urination or stool, weakness, tingling, or numbness.

The patient has no significant medical or surgical history, is up to date with his vaccinations, takes no medication, and has no known allergies. He lives with his mother and attends middle school. He denies illicit drug use, sexual activity, or intentionally induced vomiting. Family history is notable for gastroesophageal reflux disease in his mother but is otherwise negative for infection, malignancy, immunodeficiency, or endocrine or cardiac abnormalities.

In our emergency department, the patient showed clinical signs of dehydration. His initial vital signs showed tachycardia and positional hypotension. On exam, he was a well-developed boy who appeared comfortable and in no acute distress. His neck was supple and non-tender, and no lymphadenopathy or masses were appreciated. His eyes appeared normal, with extra-ocular movements intact and pupils that were equal, round, and reactive to light. Mucous membranes were slightly dry. Cardiovascular examination was significant for a grade II/VI systolic ejection murmur that was loudest at the left sternal border and radiating to the apex. His peripheral pulses were bounding but equal bilaterally. His abdomen was soft, non-tender, non-distended, with normal active bowel sounds and no appreciable organomegaly. Complete neurological examination was normal.

In the emergency department, the patient was given two normal saline fluid boluses. Urine and blood work were sent, a purified protein derivative was placed, and a chest radiograph (CXR) and a head computed tomography (CT) were performed. The patient was admitted to the general pediatric service for dehydration and further workup of his presenting symptoms.

Laboratory results were significant for a slightly low white blood cell count of 3.48k/mcL (normal, 3.84-9.8), elevated total bilirubin of 1.4 mg/dL (normal

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Editor’s note: Each month, this department features a discussion of an unusual diagnosis in genetics, radiology, or dermatology. A description and images are presented, followed by the diagnosis and an explanation of how the diagnosis was determined. As always, your comments are welcome via email at pedan@Healio.com.
< 0.8), and elevated uric acid of 9.5 mg/dL (normal 2.7-6.8); lactic dehydrogenase was normal. The remainder of his complete blood count and basic chemistry panel were all within normal limits. Urinalysis revealed elevated total protein and ketones but was otherwise normal. CXR and head CT were found to be normal.

**Diagnosis:**

Hyperthyroidism Caused by Graves’ Disease

The patient’s thyroid-stimulating hormone (TSH) level came back significantly suppressed, at < 0.01 milli-international units/L (normal, 0.52-5.08), most likely indicating a hyperthyroid state. At this time, our endocrinology team was consulted and a complete thyroid function panel, thyroid peroxidase (TPO) antibodies, and thyroid-stimulating immunoglobulin (TSI) were obtained. The results were indicative of hyperthyroidism caused by Graves’ disease. Initial thyroid laboratory results included T3 of 402 ng/dL (normal, 60-228), free T4 of 8.09 ng/dL (normal, 1-1.6), TSI of 365 microinternational units/mL (normal < 140), and thyroid peroxidase antibody (TPO) antibody of 259 international units/mL (normal < 35). Given that there is mention in the literature of associated or concomitant adrenal insufficiency with Graves’ thyrotoxicosis, an adrenocorticotropic hormone level and random serum cortisol level were also drawn but were found to be normal.\(^1\)

**DISCUSSION**

Our patient presented with atypical symptoms of an already rare disease in children. Only approximately 5% of patients with hyperthyroidism are younger than age 15 years. In children, Graves’ disease is the leading cause of hyperthyroidism. It occurs more frequently in girls than in boys and often presents in adolescence.\(^2\) The classic manifestations of hyperthyroidism are the well-recognized conglomerate of symptoms that can include weight loss, heat intolerance, palpitations, excessive sweating, nervousness, muscle weakness, fatigue, sleep disturbance, increased hunger, oligomenorrhea, and diarrhea. Clinical signs of hyperthyroidism may also include tremor, tachycardia, bruit, brisk deep tendon reflexes, lid lag, moist palms, or goiter. Signs more specific for Graves’ disease include a diffuse goiter, ophthalmopathy, and dermatopathy. Although a combination of the above symptoms can make the diagnosis easier, the initial development of symptoms, especially in children, can often be subtle and non-specific, making the diagnosis more challenging.

Although our patient exhibited a few of the typical symptoms (including weight loss, palpitations, and tachycardia), these symptoms and findings were secondary and non-specific. His primary complaint and only reason for seeking medical attention was the persistent emesis.

**Hyperemesis and Hyperthyroidism**

Severe, persistent vomiting is an uncommon presentation of hyperthyroidism; however, there have been a few isolated case studies in adults that have reported emesis as the presenting symptom of thyrotoxicosis. Hoogen-doorn and Cools\(^3\) described a case of a 32-year-old woman found to have Graves’ disease who presented with persistent vomiting, epigastric pain, and weight loss. The patient was treated with propylthiouracil and a beta-blocker, with resolution of symptoms within 1 day. Similarly, Chen et al\(^4\) reported severe post-prandial vomiting (two to three times daily) and weight loss as the prominent sign of hyperthyroidism in a 24-year-old Chinese man. The only mention of vomiting as the main symptom of hyperthyroidism that we could find in the pediatric population was in a German medical journal where a 12-year-old boy presented with sudden onset of recurrent nausea and vomiting.\(^5\)

Thyrotoxicosis itself is defined as the clinical syndrome occurring when tissues are exposed to excess amounts of thyroid hormone. The mechanism of emesis caused by thyrotoxicosis is unknown. It has been suggested that excess thyroid hormone may directly alter gastric motility, affecting propulsion of the gastrointestinal tract. Alternatively, excess thyroid hormone may also stimulate the chemoreceptor trigger zone in the central nervous system, thereby contributing to emesis.\(^5\)

The sympathomimetic effect of increased beta-adrenergic activity and elevated levels of beta-adrenergic receptors in thyrotoxicosis is well understood to account for more classic presentations of hyperthyroidism, including tachycardia, tremulousness, anxiety, and palpitations. This mechanism is readily supported by the fact that beta-blockers rapidly resolve these symptoms. Similarly, increased beta-adrenergic receptor activity may also account for hyperemesis in the hyperthyroid state. Several studies have suggested this mechanism, with the observation of complete resolution of hyperemesis following administration of a beta-blocking agent.\(^3,5\)

Similarly, the clinical syndrome of hyperemesis gravidum, a severe and persistent nausea and vomiting that often leads to weight loss and dehydration in early pregnancy, may prove to be an important correlation between hormones and emesis. The prevalence of hyperemesis gravidum is estimated to be 0.3% to 2%, increasing with
multiple pregnancies and in gestational trophoblastic disease secondary to elevated levels of human chorionic gonadotrophin (HCG) levels.\(^8\) This glycoprotein hormone is secreted by the placenta and the unique beta subunit confers specificity of HCG, which comprises the pregnancy screening test. The alpha subunit, however, is shared with TSH and follicular-stimulating hormone. As such, HCG has thyroid-stimulating properties, and pregnant women with hyperemesis gravidum are commonly found to have relatively higher levels of T4 and T3 and lower levels of TSH when compared with other pregnant women.\(^9\)\(^\text{11}\) It has been suggested that these elevated levels of fasting thyroid hormones may be a contributing factor to hyperemesis in this setting of early pregnancy.

**FOLLOW-UP**

Once diagnosed, our patient began treatment for his hyperthyroidism with methimazole, which inhibits thyroid hormone synthesis by blocking the oxidation of iodine in the thyroid gland. His symptoms improved quickly and he was discharged shortly afterwards. Since discharge, he has been followed closely by our Endocrinology service, and although compliance has been an ongoing issue, his symptoms have been well controlled when he takes the medication as prescribed.

**CONCLUSIONS**

Although there have been a few case reports in adults that have described hyperemesis as the chief complaint in newly diagnosed hyperthyroidism and thyrotoxic states, our case represents a unique description of this atypical and rare presentation of hyperthyroidism in the pediatric population in the United States. It reminds us that we need to be thorough when obtaining a review of systems as well as keeping a broad differential when investigating prolonged, unexplained emesis.

**REFERENCES**