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Thyroidectomy in a two-year old for graves' disease

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ABSTRACT

INTRODUCTION: The most common cause of hyperthyroidism in children is graves' disease – an autoimmune disorder in which antibodies stimulate the thyrotropin receptor to signal growth thyroid gland by increasing thyroid hormone synthesis and release. It can be treated with medical therapy, radioactive iodine, or surgery.

PRESENTATION OF CASE: JD was a two year old male who presented with severe diarrhea and diffuse neck enlargement. Laboratory work up was consistent with graves' disease.

DISCUSSION: Despite maximal outpatient and inpatient treatment with methimazole, atenolol, prednisone, and SSKI, he suffered persistent thyrotoxicosis. He underwent near-total thyroidectomy without complication.

CONCLUSION: This case is notable as it may represent the youngest patient in the literature who has undergone thyroidectomy for graves' disease.

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1. Introduction

The most common cause of hyperthyroidism in children is graves' disease – an autoimmune disorder in which antibodies stimulate the thyrotropin receptor to signal growth thyroid gland by increasing thyroid hormone synthesis and release. It can be treated with medical therapy, radioactive iodine, or surgery. Thyroidectomy is not often employed as a therapy in graves' disease. We present the case of a two-year old male with graves' disorder unresponsive to medical therapy who underwent near total thyroidectomy, whom we believe to be the youngest patient to undergo thyroidectomy for graves'.

The estimated prevalence of graves' in children ranges between 1 and 20 in 100,000 [1,2]. Manifestations of the disease mimic that of adults, with a few key differences. graves' in children nearly always presents with a goiter [3]. Ophthalmopathy is more common than in adults but less severe; rarely is dermopathy or atrial fibrillation seen in children [4].

Graves' can affect growth and puberty in children by delaying its onset or slowing its progression. It can lead to increased height and advancement of bone age [5]. Weight loss is a common characteristic resulting from thyroid-induced calorigenesis as well as malabsorption secondary to increased gut motility.

Most children with graves' have a family history of hyperthyroidism. Twin studies' have demonstrated that 80% of the risk of graves' in children can be attributed to genetics. There is an increased prevalence of co-existing autoimmune disorders, including celiac disease and myasthenia gravis. Blood tests may demonstrate a positive ANCA titer [6]. Associations exist with non-autoimmune disorders, including Down Syndrome and Turner Syndrome [7].

Other causes of hyperthyroidism in children include toxic multi-nodular goiter, toxic adenoma, Hashitoxicosis, and subacute thyroiditis. Diagnosis of graves' can be made by serum detection of thyrotropin-receptor antibodies, found in 60–90% of children with graves' [8].

2. Case presentation

In April of 2011, JD presented to his pediatrician as a two-and-a-half-year old male with severe diarrhea and diffuse neck enlargement. His mother complained that he had increasing hyperactivity, insomnia, diaphoresis, and tachycardia. Laboratory evaluation was consistent with graves' disease, with an undetectable TSH, a total T4 level of 31.2 mcg/dL, and a TSI of 407% the normal value. He was started on methimazole, atenolol, prednisone and saturated solution of potassium iodide (SSKI). He continued to have symptoms, despite outpatient management involving increasing doses of this regimen, with diarrhea being the most persistent.

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Table 1
Lab values upon presentation May 3, 2011.

	Normal values	JD
Free T4 (Thyroxine)	0.9–1.7 ng/dL	5.49
Estimated FTI	6.0–10.5	27.4
Thyroglobulin Ab	Negative	160
TPO Ab	Negative	>20480
TSH (Thyrotropin)	0.3–4.0 mIU/mL	<0.01
T3 (Tri-iodothyronine)	80–195 ng/dL	597
T4 (Thyroxine)	5.0–11.6 mcg/dL	19.2

He was born full-term without complications in his medical or developmental history until April 2011. He walked at age one, spoke intelligibly at age 15 months, and was able to speak three-word sentences with an adequate vocabulary at age two. His mother was diagnosed with graves' disease at age eight, which was active until age 13 and then quiescent until 2006, three years prior to JD's birth. She was taking propylthiouracil at the time of JD's birth, with normal thyroid levels throughout pregnancy. There was no evidence of neonatal thyrotoxicosis. JD's family history was also significant for a paternal grandmother and paternal aunt with unspecified thyroid disorders. There were no other known autoimmune diseases in his family.

In late April 2011, JD was admitted to a local hospital for stabilization of his cardiac and thyroid function. While inpatient, his dose of methimazole was increased; atenolol, prednisone, and SSKI doses were maintained. He was transferred to the University of Chicago on May 3, 2011, for persistent thyrotoxicosis. Table 1 lists his laboratory data upon presentation. Workup demonstrated a concurrent rotavirus infection; he was treated with resuscitative intravenous fluids and discharged on hospital day two with pediatric endocrinology follow-up.

The symptoms of dry skin, diarrhea, and tachycardia had persisted despite maximal outpatient and inpatient medical management. Because of his intractable symptoms, his pediatric endocrinologist referred him for surgical management.

In June 2011, JD was pre-admitted the evening prior to surgery. He received pre-operative stress dose steroids because of his prednisone usage. Under general anesthesia, he underwent a near-total thyroidectomy. Estimated blood loss was ten milliliters; a subcutaneous Jackson-Pratt drain was left in the surgical field. He was admitted to the Pediatric Intensive Care Unit overnight. On post-operative day one, the drain was removed. He was discharged on a steroid taper on post-operative day three after an uncomplicated hospital course. Final pathology demonstrated 27 g of thyroid tissue consistent with treated graves' disease.

He was seen in post-operative clinic two weeks later. His symptoms of diarrhea and tachycardia had resolved and he was tolerating his steroid taper. The incision was healing well without signs of infection. His post-operative calcium levels never altered. He was started on levothyroxine.

One month after surgery, JD demonstrated symptoms and laboratory evidence consistent with hypothyroidism. His levothyroxine was increased by his pediatric endocrinologist. Approximately six months after surgery, his laboratory values normalized with levothyroxine.

3. Conclusion

This case is notable as it represents the youngest patient in the literature who has undergone thyroidectomy for graves' disease. After medical management was insufficient to control JD's symptoms, other modalities were considered. Because of his young age, radioactive iodine was ruled out as a possibility. The risks and benefits of surgery were discussed with his family. Near-total thyroidectomy was successful in palliating his symptoms.

Treatment modalities for graves' mirror those of the treatment of adults and can be divided into three categories: medical therapy, radioactive iodine, and surgery.

Initial medical therapy most often consists of methimazole or propylthiouracil. These drugs offer a chance of permanent remission at a lower cost than the other modalities. However, anti-thyroid medications have side effects including cutaneous symptoms (rash, hives), arthralgias, and gastrointestinal symptoms; rarer but more serious side effects include hepatotoxicity, granulocytopenia, and vasculitis. Further symptom management can necessitate usage of beta blockers; atenolol is preferred because of its lower risk of bronchospasm. Whereas all three modalities require routine monitoring, surveillance is more intensive with medical therapy.

The majority of pediatric endocrinologists recommend medical therapy as an initial treatment. Methimazole is preferred to propylthiouracil for its lower side effect profile, especially with respect to hepatotoxicity [9]. 87–100% of children become euthyroid in a period of weeks to months. The intention of treatment is to render the patient euthyroid and then wean the anti-thyroid medication. A recent trial demonstrated a total of 50% in remission at 4.5 years [10].

Radioactive iodine is delivered in oral form; it can offer permanent cure of hyperthyroidism. However, each treatment requires radiation precautions for up to a week afterwards. Exposing young children to radiation raises concerns for resultant cancer, often leading parents of patients and physicians away from this treatment modality. Radioactive iodine has traditionally been reserved for children who suffer side effects from medical therapy; recently, however, its usage as a first line therapy has increased.

Surgery offers a timely and permanent cure for hyperthyroidism but is most often regarded a second-line treatment modality after medical therapy. The risks of surgery include hypothyroidism, hypoparathyroidism secondary to parathyroid injury, recurrent laryngeal nerve injury, infection, and the risk of bleeding and anesthesia. However, in experienced hands, thyroid surgery in children has no greater risk than in adults. There is also substantial initial cost involved as compared with the other therapy modalities. The most commonly performed operation is a near-total thyroidectomy, leaving minimal thyroid tissue to balance the risk of persistent hyperthyroidism with permanent hypothyroidism.

Conflicts of interest

None.

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Author contribution

All authors contributed equally to the preparation of this manuscript.

Consent

Written informed consent was obtained from the patient's mother (also the legal guardian) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Disclosures

The authors have nothing to disclose.

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