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## Case Report

# Thymic Hyperplasia Associated with Graves' Disease in a 10-year-old Boy

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**Abstract.** Thymic hyperplasia associated with Graves' disease is rarely reported in children, although it is not uncommon in adults. Occasionally, an enlarged thymus presents as an anterior mediastinal mass on a radiographic examination. Such patients often undergo invasive procedures such as a thymus biopsy or thymectomy because of suspected malignancy. However, an enlarged thymus with Graves' disease is known to shrink after treatment with antithyroid drugs. Therefore, recognition of this benign course would avoid unnecessary surgical resection. This report presents the case of a 10-yr-old boy with Graves' disease complicated with an anterior mediastinal mass. Computed tomography showed a homogenous mass with no invasion into the surrounding tissue. A gallium-67 scintigraphy showed no abnormal uptake. Shrinkage of the mass after treatment with an antithyroid drug (methyl-mercaptoimidazole) supported the diagnosis of thymic hyperplasia with Graves' disease. This case report illustrates two important points. First, pediatricians should be aware that thymic hyperplasia can coexist with Graves' disease, even in children. Second, close radiographic assessment would support a diagnosis of thymic hyperplasia and eliminate invasive diagnostic procedures.

**Key words:** Thymic hyperplasia, Graves' disease, children

### Introduction

Thymic hyperplasia is a known feature of Graves' disease in adults (1), but is rarely reported in children. Murakami *et al.* demonstrated an association between thymic size and Graves' disease by computed tomography (CT). Their study in adults showed that thymic size and density were significantly increased in untreated patients with Graves' disease and that the size and density of the thyroid decreased markedly after 5 to 24 mo of treatment with antithyroid drugs (2). Therefore, thymic hyperplasia with Graves' disease will regress in response to treatment with appropriate antithyroid drugs, and its recognition would eliminate a thymus biopsy or thymectomy to establish the diagnosis (3).

This report presents the case of a 10-yr-old boy with thymic hyperplasia associated with Graves' disease. The anterior mediastinal mass shrank markedly after 3 wk of treatment with an antithyroid drug, thus allowing the patient to avoid invasive diagnostic procedures.

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## Case report

A 10-yr-old boy with Down syndrome was referred to the hospital for treatment of pneumonia. He had a surgically repaired atrioventricular septal defect. Poor weight gain (1.2 kg gain from 7 to 10 yr old) and increased sweating had been noted for about 3 yr. The family history was negative for thyroid abnormalities. His height was 119.0 cm (–3.15 SD), body weight was 17.0 kg and body mass index was 12 kg/m$^2$. His body temperature was 37.5C, heart rate was 120 beats/min and respiratory rate was 30 breaths/min. A physical examination revealed fine finger tremor and mild exophthalmos. His skin was moist. The thyroid gland was diffusely enlarged, elastic, soft and non tender. Each lobe was approximately 3 × 2 cm in size, and a systolic bruit was heard over the thyroid gland.

The serum thyroid stimulating hormone (TSH) level was less than 0.03 μIU/ml, free $T_3$ level was 27.55 pg/ml and free $T_4$ level was higher than 6.00 ng/dl. The thyroid-stimulating antibody level was elevated (195%), thus leading to the diagnosis of Graves' disease. Tumor markers such as alpha-fetoprotein and human chorionic gonadotropin were negative.

A chest X-ray film demonstrated widening of the superior mediastinum. A chest CT scan revealed an anterior mediastinal mass measuring 3 × 3 cm (Fig. 1A). The mass was homogenous in density and well enhanced. There was no calcification or invasion into the surrounding tissue. A gallium-67 scintigraphy showed no intense uptake in the mass.

A CT scan three weeks after initiation of methyl-mercaptoimidazole (MMI) showed shrinkage of the mass, thus supporting the diagnosis of thymic hyperplasia with Graves' disease (Fig. 1B). Thyroid hormone values had nearly normalized after 3 mo of treatment. A follow-up CT scan obtained after 6 mo of treatment showed continued shrinkage of the mass (Fig. 1C).

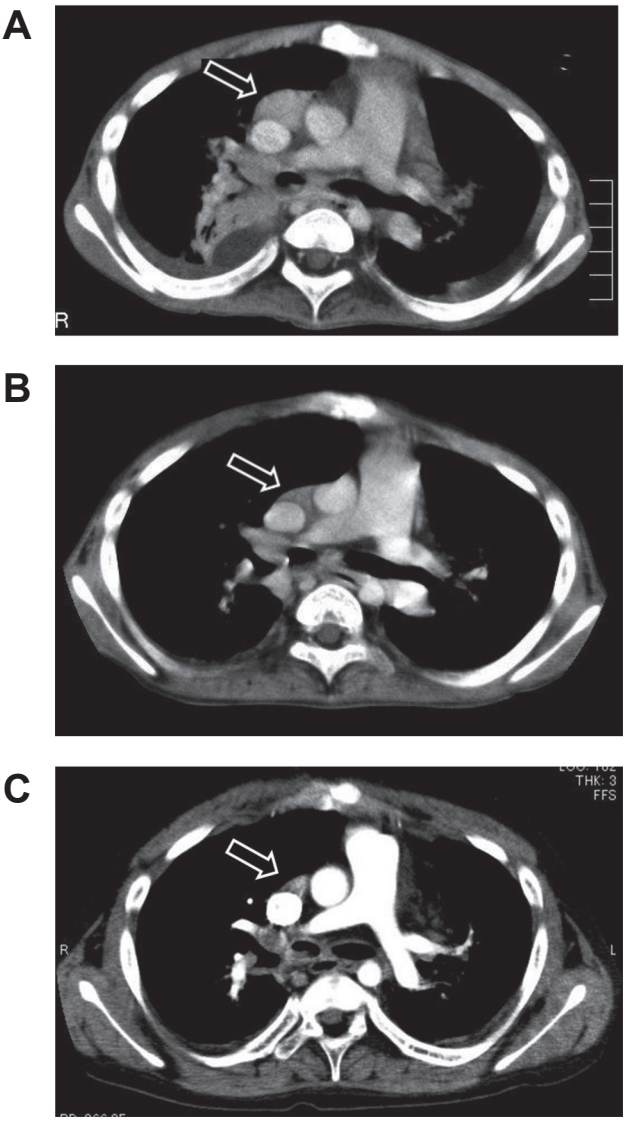


**Fig. 1** Chest CT. An arrow indicates the anterior mediastinal mass. A: At diagnosis. B: After 3 wk of antithyroid treatment. C: After 6 mo of treatment.

## Discussion

Although the precise mechanisms of thymic hyperplasia in Graves' disease are uncertain, an immunological mechanism is suspected. Several autoimmune diseases, including myasthenia gravis, are also associated with thymic hyperplasia, suggesting a contribution of

**Table 1** Summary of 25 patients with thymic hyperplasia associated with Graves' disease

| | | Number of patients |
|---|---|---|
| Sex | Male | 6 |
| | Female | 19 |
| Treatment | Thymectomy | 7 |
| | Biopsy + ATD | 8 |
| | ATD | 10 |
| Result | Immediate Thymectomy | 2 |
| | ATD + Thymectomy | 5 |
| | Regression | 18 |
| Observation period before thymectomy | None | 2 |
| | ≤ 3 mo | 2 |
| | > 3 mo | 3 |

*ATD indicates antithyroid drug.

autoimmune reactions. Wortsman *et al.* reported abnormally elevated serum immunoglobulin levels in a patient with Graves' disease who had an enlarged thymus with increased thymocyte proliferation in 1988 (4). In contrast, another report suggested that thymic hyperplasia is directly caused by elevated thyroid hormone levels, because Scheiff *et al.* showed that triiodothyronine induced thymic hyperplasia in an animal model (5). According to other reports, it is likely that thymic hyperplasia develops secondary to Graves' disease because thymectomy has no apparent effect on the course of Graves' disease (7, 8).

PubMed and Igaku Chuo Zasshi (in Japanese) list 45 Japanese cases of thymic hyperplasia associated with Graves' disease for between 1983 and 2007. Only one of these 45 patients was a child (8). Twenty-five of these 45 reported cases had no other autoimmune diseases and are summarized in Table 1. One child case was not included because she was also complicated with myasthenia gravis. The mean age of the 25 patients was 29 yr, ranging from 16 to 57 yr. Eight (32%) of the 25 patients underwent a thymus biopsy. Thymectomy was performed in 7 patients (28%). Therefore, more than half of the patients had undergone unnecessary surgical procedures. Immediate thymectomy was performed for two patients. The other 5 patients underwent thymectomy because the mass did not shrink after treatment with antithyroid drugs. However, of the 5 patients, 3 still maintained a hyperthyroid status at thymectomy. In addition, the follow-up period after the start of antithyroid therapy was relatively short (less than 3 mo) in the other 2 patients. The anterior mediastinal mass shrunk after treatment with antithyroid drugs in 18 patients. The mean duration before regression of the mass was 4.7 mo (range 3–9 mo). These cases suggest that a second radiological assessment to confirm regression of the mass should be performed more than 3 mo after of antithyroid therapy and with a normal thyroid status, while the current child case showed prompt shrinkage of the mass.

In summary, thymic hyperplasia should be considered before invasive diagnostic procedures in patients that present with an anterior mediastinal mass associated with Graves' disease, even in children. Further studies are therefore needed to fully understand the features of thymic hyperplasia with Graves' disease in children.

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