Disappearance of a Hyperfunctioning Thyroid Nodule
Following TSH Stimulation

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Following stimulation with exogenous TSH, a patient with a large hyperfunctioning autonomous thyroid nodule developed transient hyperthyroidism and decreased radiiodine uptake, and subsequently the nodule disappeared.


Although the natural history of autonomous hyperfunctioning thyroid nodules is a variable one, they usually maintain their size and autonomous hyperactive function if left untreated (1,2). The response of such nodules to thyrotropin (TSH) stimulation is also variable, for both a decrease in sensitivity (3) and hyperresponsiveness (4) have been demonstrated. We have observed a patient whose autonomous hyperfunctioning thyroid nodule responded in a most unusual manner. It not only showed a marked decrease in radiiodine uptake, but disappeared completely following administration of TSH.

CASE REPORT

In June, 1976 a 44-year-old white man sought medical attention because of a mass on the right side of his neck. On physical examination his physician found a 2½- x 3-cm solitary, nontender, movable nodule located in the right lower pole of the thyroid. There were no palpable regional lymph nodes, and the patient was euthyroid clinically. Laboratory data revealed a T3 resin uptake of 48.4% (N 37–65%), T4 9.2 µg% (N 3.8–12%). An uptake test revealed 25% at 24 hr (N 8–30%). The thyroid image showed essentially all the radioactivity to be located in the nodule (Fig. 1).

The patient was given 10 units of thyrotropin intramuscularly on each of three consecutive days. Following this, a 24-hr uptake of radiiodine was 17.5%. The nuclide was distributed throughout both lobes, with a decreased concentration in the nodule (Fig. 2). Although a T3 suppression test was not performed, the diagnosis of a hyperfunctioning thyroid nodule was considered established. An ultrasound tracing was not obtained.

One week following the injections of TSH, the patient complained of heat intolerance, anorexia, diarrhea, weakness, sleeplessness, nervousness, palpitations, and weight loss. Physical examination revealed blood pressure to be 108/68, pulse 96 per minute, and regular cardiac rhythm. The skin was warm and moist, and there was a fine tremor of the extended fingers. Deep reflexes were brisk. No lid lag was noted. The nodule showed no change from the initial examination. The remainder of the gland felt normal. Laboratory data revealed a T4 of 11.9 µg% (N 4.5–11.8), T3-RIA 210 nm% (N 80–220). The patient was thought to be mildly toxic and was placed on antithyroid drugs in preparation for surgery. He improved rapidly, and at the end of 3 wk was considered euthyroid. The previous 2½- x 3-cm nodule was no longer palpable. Examination by several physicians confirmed this new finding. The antithyroid medication was discontinued and the previously planned surgery was cancelled. The patient was seen 2 mo later. His thyroid was normal in size and shape, with no evidence of nodularity. He remained euthyroid clinically. A serum T4 was 10.7 µg% (N 4.5–11.8), and T3-RIA was 113 nm% (N 80–220). Thyroid radioiodine uptake was repeated and showed 18% of the dose in 24 hr, with the tracer distributed uniformly (Fig. 3). The patient has been seen at regular intervals over the past ½ yr. His thyroid continues to function normally and no nodules can be palpated. Thyroid image remains normal (Fig. 4).

DISCUSSION

The solitary thyroid nodule is a clinically important lesion. In a comprehensive study by Ferriman et al. (5), the histologic pattern showed the majority to be true adenoma, while most of the rest showed nodular hyperplasia, autoimmune thyroiditis, cystic degeneration, or carcinoma. These lesions possess varying degrees of physiologic activity, and when they function independently of endogenous TSH, they are referred to as autonomously functioning nodules. Should a nodule produce sufficient hormone to suppress endogenous TSH secretion, the surrounding thyroid tissue is rendered functionless. When this occurs the patient need not be hyperthyroid clinically, for hormone secretion may be only sufficient to suppress pituitary function but inadequate to promote clinical hyperthyroidism (Fig. 1). It has been shown that extranodular thyroid tissue will respond to TSH stimulation only if the patient is euthyroid, while there is little or no response if hyperthyroidism is present (6). Following TSH stimulation, our

Received Jan. 25, 1978; revision accepted May 3, 1978.
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The patient's thyroid image demonstrated preferential uptake in the paranovalar tissue with less concentration of the radionuclide in the nodule (Fig. 2). We have been able to find only one case showing a similar response (3).

One week following TSH injections, our patient appeared mildly toxic. His serum T4 was minimally elevated. Plasma levels of free T4 and T3 were not determined. Hyperthyroidism could have resulted from synthesis and release of hormone by stimulated normal tissue or possibly by release of preformed hormone from the nodule. Thyroid imaging at intervals more frequent than 24 hr might have demonstrated a difference in the rate of hormone turnover in various portions of the gland. It is also conceivable that TSH could have induced tissue changes within the nodule like those of subacute thyroiditis; in such an event increased release of hormone along with decreased radionuclide uptake would be expected.

At the time of his initial examination our patient had a thyroid nodule of substantial size. Although a cystic component was not definitely excluded by ultrasound, the scan was compatible with a solid lesion. It was a surprise to find the nodule had disappeared completely in the short interval of 3 wk between examinations. Long-term studies of a large number of patients indicate that it is most unusual for untreated thyroid nodules to ever decrease in size, even if they undergo partial cystic degeneration (2,9,10).

The part played by TSH, if any, in causing regression of the nodule is purely speculative. Could such stimulation have compromised the nodule's blood supply, thereby inviting infarction or hemorrhage? Since the patient never experienced pain, tenderness, or acute swelling of his gland, it is unlikely that any of these phenomena occurred. If infarction of the nodule following TSH stimulation was responsible for its resolution, it would represent a rare occurrence indeed, for it has not been reported in over 200 patients submitted to TSH testing (1–3,9). Moreover, in a few instances where it has been known to occur, the nodule has regressed in size only over a long period of time (8,10). It would seem a short period of treatment with methimazole and iodide would not account for disappearance of this nodule.

Followup examination at 1½ yr reveals the thyroid gland to be normal to palpation, and the scan shows no focal or irregular areas of uptake (Fig. 4). The thyroid function tests are normal at this time, indicating re-establishment of the pituitary-thyroid axis.

REFERENCES