# Faster Assessment of Patients Receiving Unnecessary Thyroid Treatment: Concise Communication

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**Forty-five consecutive patients on thyroid hormone treatment without obvious indication were evaluated. Twenty-five of these cases were found to have no evidence of thyroid disease. Biochemical testing was not helpful in making the diagnosis of hypothyroidism in the majority of thyroid-treated hypothyroid patients. Normal technetium images were obtained in 25 patients, 22 of which had no thyroid disease. In contrast, abnormal technetium images were obtained in 20 patients, 16 of whom were thought to be hypothyroid, and one of whom developed a goiter within 2 mo after discontinuing levothyroxine. The use of technetium imaging seems useful for the rapid (20 min) evaluation of those patients likely to benefit from discontinuing thyroid medication.**

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Many patients are currently being treated with thyroid hormone for reasons that are quite unclear. Some were advised to take thyroid hormone without any prior thyroid testing—for symptoms such as obesity, infertility, menstrual disorders, lethargy, and depression. Others were diagnosed as having "hypothyroidism" by older tests, now outdated, lacking both sensitivity and specificity. Still other patients have no idea at all why they might be taking such medications.

Whenever we encounter patients on long-term thyroid treatment without obvious indication, we usually reassess their thyroid function (*1*). The traditional approach for such evaluation is the performance of a TSH uptake. Unfortunately, this test is somewhat inconvenient, since it requires at least one injection of bovine TSH followed by a radioiodine uptake at 24 hr. In addition, as with any foreign protein, bovine TSH injections may result in allergic responses (*2*).

In an effort to expedite the evaluation of such patients, we have explored the use of Tc-99m (as pertechnetate) imaging in 45 consecutive patients. The study demonstrates that technetium imaging is a rapid (20 min) and convenient tool in this setting.

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## MATERIALS AND METHODS

Our 45 consecutive patients were on thyroid-hormone treatment without obvious indication. None of them had goiters, previous thyroid surgery or I-131 therapy, or strong evidence of prior adequate study. Thyroglobulin antibodies (radioassay) and microsomal antibodies (hemagglutination) were obtained in 37 of these patients. The serum FTI ($T_4 \times T_3$ uptake), serum TSH(RIA), and technetium imaging was performed in all cases, 20 min after intravenous injection of (Tc-99m)pertechnetate. A normal technetium image was defined as an adequate and uniform tracer uptake permitting the visualization of a thyroid gland of normal size and structure (Fig. 1). An abnormal technetium study was defined as either poor tracer uptake with inadequate imaging for structure evaluation (Fig. 2), or adequate tracer uptake with a clearly abnormal thyroid structure (Fig. 3). In each case the image was characterized as normal or abnormal before assessment of any biochemical data. In some cases TSH uptakes were obtained by administering 5 units of TSH* intramuscularly and then measuring the

FIG. 1. Normal scintiphoto.

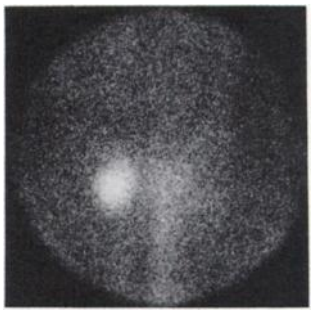

FIG. 3. Adequate tracer uptake but abnormal structure.

I-131 uptake at 24 hr. When the technetium image was normal, or when the TSH uptake exceeded 5% at 24 hr, thyroid medication was discontinued and the patient was re-evaluated in two months. At this next visit a serum FTI and serum TSH were obtained. In some cases a TRH test was obtained as well. If function studies were normal, two months after discontinuing thyroid medication, the medications were discontinued permanently.

## RESULTS

In the study group there were 40 females and 5 males. The mean age was 41.2 ± 13.6 (s.d.) yr (range = 20–78). Most of these patients had been treated with thyroid hormone for many years (11.1 ± 9.9 yr, range 0.13–40.0). The majority of them (25 of 45, 55.6%) were ultimately found to have no evidence of thyroid disease two months after discontinuing their medication. Only 19 patients were thought to be hypothyroid and actually required continued treatment with thyroid hormone. One patient, although euthyroid, developed a goiter two months after discontinuing thyroid medication.

In the 19 hypothyroid patients on thyroid medication the initial serum FTI was found to be low in four, normal in 11, and elevated in four. The serum TSH was elevated in three of the patients with a low serum FTI and in two with normal FTI; it was normal in the remaining 14 cases. Therefore initial biochemical testing was not helpful in making the diagnosis of hypothyroidism in the majority of these patients (13 of 19 cases, see Table).

FIG. 2. Poor tracer uptake with inadequate imaging.

Technetium imaging was done in all 45 patients; it gave a normal result in 25 cases and an abnormal in 20. Twenty-two of the 25 patients with a normal image were ultimately found to have normal thyroid function. Three patients who had normal images were later found to have very mild hypothyroidism on TRH testing two months after discontinuing thyroid medication (see Table: Patients 12, 14, and 17). On the other hand, 16 of 20 patients with an abnormal thyroid image were eventually thought to be hypothyroid. Of these 16, one had adequate tracer uptake but a clearly abnormal thyroid structure, and 15 had poor tracer uptake with inadequate structural imaging.

The speed of technetium imaging (20 min after intravenous injection, preset for 150,000 counts) was correlated with the technetium dose administered in the patients without thyroid disease (technetium dose = 9.0 ± 0.9 mCi, imaging time = 244.6 ± 72.3 sec, $r = 0.52$, $p < 0.01$). No such correlation was present in the patients thought to be hypothyroid (technetium dose = 9.0 ± 0.7 mCi, imaging time = 291.7 ± 69.7 sec, $r = 0.09$). There was no difference in the size of thyroid hormone doses administered to the euthyroid and hypothyroid populations. A positive correlation between scan speed and technetium dose has previously been observed in our laboratory in a group of normal patients who were not on thyroid-hormone treatment ($n = 19$, technetium dose = 8.5 ± 0.9 mCi, scan time = 150.5 ± 58.2 sec, $r = 0.42$, $p < 0.05$).

Nineteen patients had TSH uptakes, of which 8 were normal (>5% at 24 hr), and 11 abnormal (<5% at 24 hr). In these 19, after both technetium imaging and TSH uptakes, the findings were in agreement in 15 cases but discordant in four. Three of the latter, all of which had no thyroid disease, had abnormal technetium imaging (poor tracer uptake) but normal TSH uptake studies. Of three discordant cases, one patient was taking kelp and another was on excessive doses of thyroxine; there was no apparent explanation in the third case. In one case there was an abnormal technetium image but a normal TSH uptake. The technetium image proved to be the more helpful test in this case, since the patient developed a diffuse firm goiter (30 grams) two months after dis-

**TABLE 1. HYPOTHYROID PATIENTS**

| Patient | Sex | Years of thyroid treatment | Thyroid preparation daily dose | Serum FTI | Serum TSH | Antibodies TAB/MAB | TSH uptake | Tech. image |
|---|---|---|---|---|---|---|---|---|
| 1 | M | 32 | Extract-3 gr | 1.2 | 20.8 | 7/neg. | 2% | Poor uptake |
| 2 | F | 10 | Extract-2 gr | 1.8 | 3.2 | 6/neg. | 4% | Poor uptake |
| 3 | F | 10 | Extract-1 gr | 0.8 | 6.9 | 8/25,600 | 3% | Poor uptake |
| 4 | F | 30 | Extract-1 gr | 1.7 | 8.6 | 8/neg. | — | Poor uptake |
| 5 | F | 9 | LT4-0.2 mg | 4.1 | 2.5 | 30/100 | 3% | Poor uptake |
| 6 | F | 2 | Extract-3 gr | 2.5 | 1.8 | 9/neg. | 3% | Poor uptake |
| 7 | F | 20 | LT4-0.15 mg | 3.1 | 3.5 | 66/6400 | 4% | Poor uptake |
| 8 | F | 33 | Extract-2 gr | 1.6 | 4.3 | 16/1600 | 3% | Poor uptake |
| 9 | M | 14 | Extract-3 gr | 4.1 | 1.9 | 13/1600 | 2% | Poor uptake |
| 10 | F | 16 | LT4-0.15 mg | 3.8 | 2.2 | 6/neg. | 2% | Poor uptake |
| 11 | F | 15 | Extract-1 gr | 0.9 | >80 | 17/neg. | — | Poor uptake |
| 12 | F | 2 | Extract-1 gr | 1.5 | 4.3 | 10/neg. | — | Normal |
| | | | None | 1.5 | 7.4/65.0* | — | — | — |
| 13 | F | 8 | Extract-2 gr | 0.9 | >80 | 9/6400 | — | Abnormal structure |
| 14 | F | 10 | LT4-0.15 mg | 3.8 | 1.9 | 7/neg. | 5% | Normal |
| | | | | 2.1 | 7.3/44.0 | — | — | — |
| 15 | M | 15 | DT4-6 mg | 5.7 | 2.2 | 13/400 | 2% | Poor uptake |
| 16 | F | 23 | LT4-0.15 mg | 5.0 | 2.2 | 6/neg. | 3% | Poor uptake |
| 17 | F | 10 | LT4-0.15 mg | 3.7 | 3.7 | 5/neg. | 9% | Normal |
| | | | | — | 6.3/59.8 | — | — | — |
| 18 | F | 2 | LT4-0.15 mg | 2.5 | 19.0 | 61/25,000 | — | Poor uptake |
| 19 | M | 10 | Extract-2.5 gr | 1.9 | 1.3 | 6/neg. | 4% | Poor uptake |

* Twenty minutes after 100 μg of TRH (Protirelin) administered intravenously, the serum TSH was 65 μIU/ml (normal rise 2–20 μIU/ml).

Normal ranges: FTI, 1.4–4.0; TSH, <8 μIU/ml; TAB (thyroglobulin antibodies), <13%, MAB (microsomal antibodies), <1:6400.

continuing thyroid medication. Although the patient is currently euthyroid, it is conceivable that she may yet develop hypothyroidism.

## DISCUSSION

We were not certain when we started this project that we would obtain an adequate thyroid image in enough normal patients on thyroid medication, since these glands would be at least partially suppressed. We were pleasantly surprised to find that the majority (22 of 25) of patients without evidence of thyroid disease had normal thyroid images despite thyroid treatment. If smaller doses of technetium were used, or if radioiodine were the tracer, the results might not have been as rewarding. Apparently a suppressed normal gland possesses adequate trapping function to enable a satisfactory image to be obtained at 20 min. Images using radioiodine depend upon organification of the concentrated iodine whether performed at 6 or 24 hr. This, plus the markedly reduced photon flux available with a standard scanning dose of radioiodine (100–400 μCi), seems to account for the known inability of radioiodine to image a normal gland on suppressive doses of thyroid hormone (*2*).

It was of interest that the dose of technetium administered was correlated with the speed of technetium imaging (accumulation of 150,000 counts at 20 min after intravenous injection) in the patients without evidence of thyroid disease. However, in the hypothyroid patients no such correlation was present, offering further evidence that the technetium study provides some functional differentiation between the normal patients and those with hypothyroidism.

Dyshormonogenesis, often observed in Hashimoto's thyroiditis, also did not seem to hinder us. We expected patients with Hashimoto's thyroiditis, a most common cause of hypothyroidism, to be able to trap the technetium avidly (*3,4*). However this study excluded all patients with goiters. Perhaps after many years of thyroid treatment, when goiters are rather completely reduced and a thin flattened and perhaps fibrosed remnant remains, there is not sufficient trapping to cause confusion in these cases of Hashimoto's thyroiditis. In any event, when a normal thyroid image is present, the chances of severe hypothyroidism are rather remote. A normal thyroid image does not exclude very mild thyroid insufficiency. An abnormal thyroid image is associated with hypothyroidism in the majority of cases, but an

abnormal image may be less reliable when patients are on kelp or excessive doses of thyroxine.

One might argue whether or not such testing is required when one could merely discontinue thyroid medication for a period of two months and reassess the blood values then. Nevertheless, in severe hypothyroidism discontinuing medication for a two-month period could be annoying and, in the occasional patient, perhaps hazardous as well. It seems prudent to offer such patients the benefit of technetium imaging. When a normal image is present, it seems reasonable to discontinue thyroid medication for a period of two months, with the knowledge that severe hypothyroidism is quite unlikely.

Case 15 was of special interest, since he had been treated for 15 yr with D-thyroxine because of hypercholesterolemia. Our studies clearly demonstrated that the underlying hypothyroidism was the cause of his hyperlipidemia. D-thyroxine was discontinued and L-thyroxine was administered. We have previously cautioned that, even in the absence of goiter, hypothyroidism should be excluded in all patients with significant hypercholesterolemia (*5*).

Finally, we are distressed by the realization that many patients are taking thyroid hormone needlessly. We feel that such medication should be started only for reasonable medical indications, and should no longer be used for empirical indications. Thyroid hormone is a very poor choice as placebo, since adequate testing and followup is required to discontinue this medication safely. We urge physicians to be skeptical when encountering patients being treated with thyroid medication without obvious indication. Most such patients will be found to have no evidence of thyroid disease (*1*).

## CONCLUSIONS

Forty-five patients on thyroid-hormone treatment without obvious indication were evaluated. Twenty-five of these were found to have no evidence of thyroid disease. Biochemical testing was not helpful in making the diagnosis of hypothyroidism in the majority of thyroid-treated hypothyroid patients. Normal technetium images were obtained in 25 patients, 22 of which had no thyroid disease. Three patients with normal technetium images were subsequently found to have very mild hypothyroidism. In contrast, abnormal technetium images were obtained in 20 patients, 16 of which were thought to be hypothyroid, and one of which developed a goiter within 2 months after discontinuing levothyroxine.

Technetium imaging seems useful for the rapid (20 min) evaluation of those patients who might benefit from discontinuing thyroid medication. Additional studies may shed further light on the indications and limitations of this method.

## FOOTNOTE

* Thytropar, Armour.

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