

Case Report

Thyroid Uptake of [^{99m}Tc] Pertechnetate during In Vivo RBC Labeling: Incidental Diagnosis of Hypothyroidism

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Increased thyroid activity was incidentally observed during an in vivo labeled Tc-99m blood pool scan and subsequent evaluation resulted in a diagnosis of hypothyroidism. Alternate explanations of abnormal thyroid uptake on in vivo labeled blood pool scans were considered and are discussed briefly.

A 53-year-old white man with a history of episodic lightheadedness and a borderline positive graded treadmill exercise test was referred to the nuclear medicine department for a noninvasive cardiac workup. A radionuclide ventriculogram was done using in vivo red blood cell (RBC) labeling; 5.1 mg of stannous pyrophosphate (Sn-PYP) was injected followed 22 min later with 30 mCi of [^{99m}Tc] sodium pertechnetate. The technologist noted intense thyroid activity and obtained an image (Fig. 1).

The abnormal uptake in this patient prompted an endocrine evaluation that revealed TSH:46.0 μ U/ml (normal <10); T₄:3.9 mcg/dl (normal 4.5–11.5); FTI:3.6 (normal 5.0–11.0), and negative thyroid antibodies (ATCA<100, ATGA<10). The patient was totally without signs or symptoms of hypothyroidism. Physical examination was unremarkable except for a band of firm thyroid tissue. He had a strong family history (mother and two sisters) of thyroid disease but he had never been diagnosed or treated for a thyroid condition.

The final diagnosis was primary hypothyroidism, most likely due to an intracellular enzyme defect in organification. More specific determination of the defect was deemed unnecessary since the treatment in any case would be replacement therapy. L-thyroxine was prescribed and the patient began taking it.

Discussion

Usually only faint thyroid activity is seen with in vivo labeled Tc-99m blood pool scans. The intense thyroid activity observed in this patient was unusual and suggested the presence of free pertechnetate. We considered

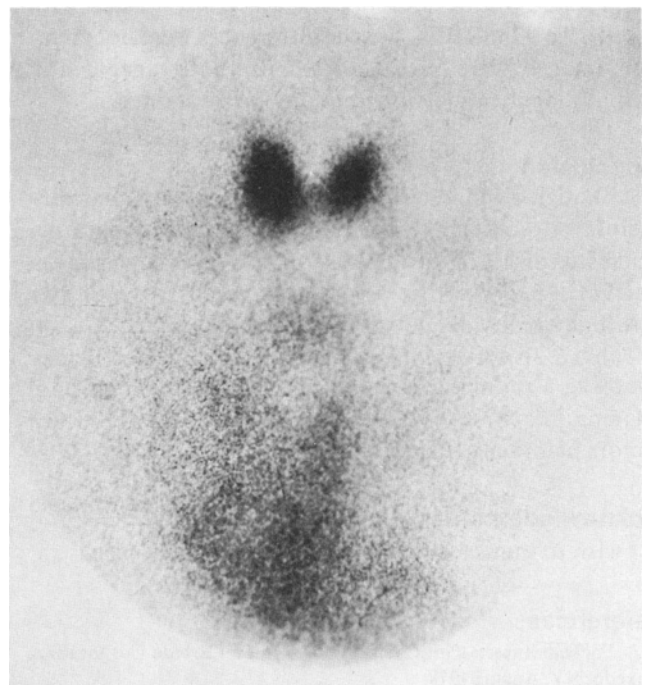


FIG. 1 Image taken after in vivo Tc-99m RBC labeling shows blood pool activity in the heart and great vessels, and intense thyroid uptake.

the following possible explanations for the abnormal thyroid uptake of pertechnetate:

- (1) recent nuclear medicine procedure with pertechnetate;
- (2) poor RBC labeling caused by (a) poor quality Sn-PYP, (b) infiltration of the Sn-PYP dose, (c) a condition (eg., Lupus, post blood transfusion) or medications (eg., aldomet, quinidine, heparin) associated with RBC antibody formation (1);
- (3) hyperthyroidism;

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- (4) Hashimoto's thyroiditis; or
- (5) other congenital or acquired organification defects of the thyroid.

This patient had not had a recent study with pertechnetate. The Sn-PYP was from a vial used for two other patients in whom no abnormal thyroid uptake was noted. Our patient was taking no medications and had no known conditions that have been associated with RBC antibody formation and inefficient labeling. The RBC labeling efficiency was determined by cell separation to be 97% at 25 min after pertechnetate injection. This was consistent with the observation of only minimal activity in the salivary glands and abdomen. A thyroid condition was, therefore, most likely in this case.

Intense early thyroidal trapping of pertechnetate during in vivo labeling for blood pool imaging has been reported in patients with hyperthyroidism (2). Increased uptake is also possible in patients with Hashimoto's thyroiditis and other organification defects (3). This is due to the elevated TSH, which stimulates thyroid uptake of pertechnetate (4). Esser et al. have studied the rate of accumulation of pertechnetate in the thyroid of 56 patients undergoing thyroid evaluation and found that maximum intensity uptake occurred on the average at 17.8 min after injection and ranging from 6 to over 30 min (5). Since in vivo RBC labeling is not instantaneous, it is possible that patients with rapid thyroid uptake could trap free pertechnetate before RBC labeling has occurred. In vivo labeling has been shown to follow an exponential curve that plateaus at about 10 min (6).

Conclusion

Abnormal thyroid uptake of pertechnetate during a blood pool scan was observed in a patient with no clinical symptoms of thyroid dysfunction. Further evaluation resulted in a diagnosis of hypothyroidism. Followup of incidental findings, besides being of academic interest, may sometimes lead to an unsuspected diagnosis and thereby avoid potential patient morbidity.

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