Role of Whole Body Radioiodine Scan in a Patient with Post Operative Multinodular Goiter: A Case Report

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ABSTRACT

Whole Body Radioiodine Scan with 131I is an important investigation in the management of patients with differentiated thyroid carcinomas. However, it is also useful in the evaluation of ectopic thyroid tissues and congenital thyroid abnormalities. Reported case of a 50-year-old hyperthyroid woman with history of thyroidectomy for toxic multinodular goiter had no malignancy histopathologically, but without Levothyroxine replacement therapy, she was found to be subclinical hyperthyroid biochemically. Whole body radioiodine scan with ^{131}I showed a focus of intense radiotracer concentration below the sternum and indicated that the patient had resto-sternal goiter which was undiagnosed. CT scan of the lower neck and upper chest confirmed the diagnosis as well.

Keywords: Whole body scan, radioiodine, retrosternal goiter, subclinical hyperthyroid state.

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INTRODUCTION

Whole-body radioiodine scan (WBS) with 131I is an important diagnostic test in the management of patients with differentiated thyroid cancers, especially those who underwent surgical approaches like total thyroidectomy. This scan demonstrates the presence of residual thyroid tissue on the neck or metastases in lymph nodes and other parts of the body (1). It involves the ingestion of radioiodine after certain preparations, including avoidance of levothyroxine, iodine-containing salt, and foods, then the whole body is scanned after 48-72 hours. However, this test can also identify ectopic thyroid tissues, such as remnants in the mediastinum, which conventional imaging techniques like ultrasound or CT scan may miss. Here we report a case where a whole-body radioiodine scan was crucial in identifying remnant thyroid tissue in a patient who underwent completion thyroidectomy.

CASE REPORT

A 50-year-old woman with hyperthyroidism presented to an otolaryngologist for swelling in the front of her neck for about 6 months. Previously, she underwent right-sided hemithyroidectomy about 10 years ago for hyperthyroidism; histopathology did not reveal any malignancy. After right-sided hemithyroidectomy, her hyperthyroidism persisted. She was on and off anti-thyroid drugs for the next years. Ultrasonogram of neck revealed enlarged left lobe of thyroid gland with multiple nodules. Then she underwent completion thyroidectomy. Postoperative histopathology report revealed nodular goiter. No malignant cells were found. It was planned to start levothyroxine replacement. However, the patient's serum thyroid-stimulating hormone (TSH) level was checked and found low. Her FT3 and FT4 levels were within normal ranges. So, she was in a subclinical hyperthyroid state. After 1-month, thyroid function tests were repeated and found to be the same. Ultrasonogram of the neck revealed an empty thyroid bed and no enlarged lymph nodes in the neck. Then the patient was referred to us for whole body radioiodine scan. After adequate preparation, 4 mCi of radioiodine (^{131}I) was administered orally to the patient. Then WBS was performed 72 hours later. The scan revealed intense radiotracer concentration behind the manubrium sternum. No other iodine-avid tissue was seen elsewhere in the body. The patient was advised to have a CT scan of the lower neck and upper chest for further evaluation. Currently, she is under follow-up with her endocrinologist.

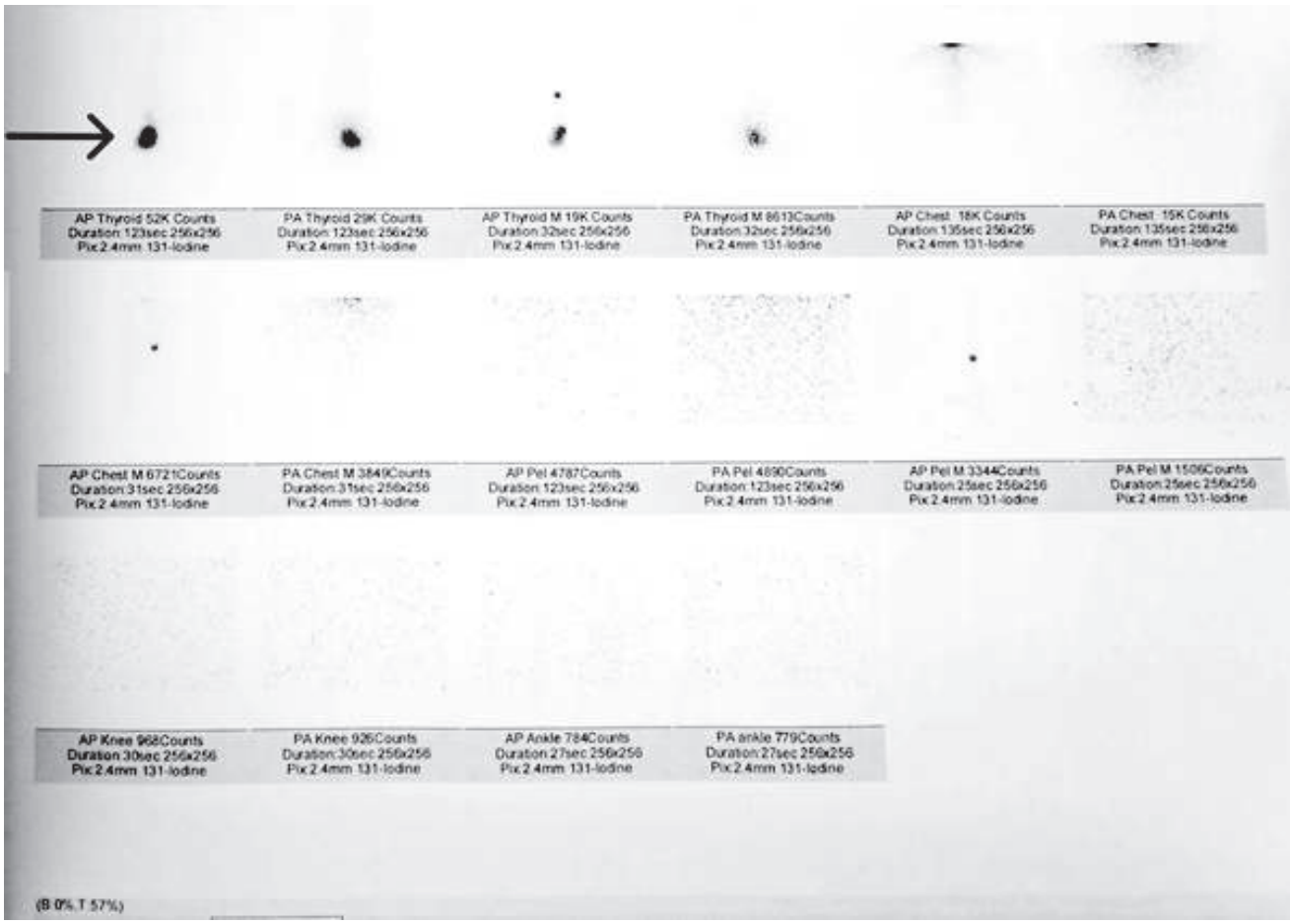

Figure 1: Whole body radioiodine scan with ^{131}I showing an intense focus of radiotracer concentration (with black arrow) behind the sternum.

DISCUSSION

Whole-body radioiodine scan is an important diagnostic tool in nuclear imaging. Due to the presence of sodium-iodide symporter, radioiodine is trapped in thyroid follicles and results in the emission of gamma rays, which are detected by a dual-head gamma camera. Diagnostic whole-body iodine scan (DxWBS) is indicated in patients with differentiated thyroid carcinoma for evaluating abnormal locoregional uptake after thyroidectomy and prior to radioactive iodine ablation and follow-up. DxWBS is considered valuable in high-risk patients with iodine-avid DTC & metastases, elevated thyroglobulin, and abnormal neck ultrasound. However, it may show a false positive result. Due to this, it is important to compare and relate the scan findings with the patient's history, physical examination findings, serum thyroglobulin level, and other imaging modalities (2).

Retrosternal goiter is defined as a goiter having mediastinal extension, and more than 50% of it is located below the thoracic inlet (7). Its incidence rates range between 0.2% and 45% of all goiters. About 20–40% of retrosternal goiters are symptomatic. Retrosternal goiters are often missed clinically and sonologically, especially if they are intrathoracic (3). Retrosternal goiters are mostly multinodular goiters. However, a significant portion of them is malignant. In a previous study, they reported postoperative histopathologic findings of 70 patients; 58.5% of the cases were multinodular goiter, 22.9% were papillary carcinoma, 7.1% were medullary carcinoma, 5.7% were anaplastic carcinoma, 5.7% were thyroid lymphoma, and only 1.4% were thyroid adenoma (4).

WBS is helpful in identifying retrosternal goiters. But usually, it is advised and performed in patients where residual thyroid tissue is suspected after they have

undergone total thyroidectomy. It can be done with radioiodine ^{123}I and ^{131}I. ^{123}I has a half-life of about 13 hours, and that of ^{131}I is 8 days. ^{123}I has a shorter half-life, but it requires production in a cyclotron; thus it is costlier than ^{131}I (7). Whole-body radioiodine scan requires specific preparations. For example, patients should discontinue use of iodine-containing medications that may affect the ability of iodine trapping and organification by the thyroid gland. Before the test, a low-iodine diet is also recommended. In patients with thyroid cancer, other than withdrawal of levothyroxine, recombinant thyrotropin (rhTSH) can be used in injection form (5). WBS is absolutely contraindicated in pregnancy.

WBS cannot differentiate between normal and malignant thyroid tissue. In these conditions, SPECT-CT has added importance as more structurally detailed information is obtained (6). As in our case, the role of WBS was pivotal in the diagnosis of retrosternal thyroid tissue.

CONCLUSION

Whole-body radioiodine scans are crucial for accurate diagnosis and management of suspected ectopic thyroid tissues and atypical thyroid function tests, especially before invasive procedures.

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