



Minimal pericardial effusion on iodine 131 whole-body scan could be a false-positive finding

Na Han, Yingying Zhang, Zengmei Si, Guoqiang Wang, Chenghui Lu, Xufu Wang

Department of Nuclear Medicine, the Affiliated Hospital of Qingdao University, Qingdao, China

Correspondence to: Xufu Wang, MD, PhD. Department of Nuclear Medicine, the Affiliated Hospital of Qingdao University, No. 16 Jiangsu Road, Qingdao 266000, China. Email: wangxufu@sina.com.

Submitted Sep 29, 2023. Accepted for publication Jan 02, 2024. Published online Jan 18, 2024.

doi: 10.21037/qims-23-1375

View this article at: <https://dx.doi.org/10.21037/qims-23-1375>

Introduction

Iodine 131 (^{131}I) whole-body scan (WBS) is critical to the management of patients with differentiated thyroid cancer (DTC) in clinical practice. It can detect normal thyroid remnants and recurrent or metastatic disease. However, ^{131}I WBS may lead to false-positive results due to a variety of physiological or pathological reasons, which may make it difficult to correctly interpret ^{131}I WBS and determine whether there is disease recurrence or metastasis. Generally, the false-positive findings on ^{131}I WBS can be categorized as physiological false-positive uptake, pathological false-positive uptake, or retention of ^{131}I and contamination (1). For the retention of ^{131}I , pericardial effusion has been reported in previous reports, but the ^{131}I uptake is generally faint or the volume of the pericardial fluid is moderate or large (2-7). Here, we report a case of papillary thyroid carcinoma (PTC) in a 33-year-old woman who showed intense uptake of ^{131}I with a minimal pericardial effusion after ^{131}I treatment.

Case presentation

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying image. A copy of the written consent is available for review by the editorial office of this journal.

A 33-year-old woman with PTC was admitted to our department for radioiodine therapy (RT) after total

thyroidectomy and left side lymph node dissection. The pathology results showed that the right lobe was Hashimoto thyroiditis, the left lobe was PTC with the tall cell variant, and the tumor diameter was 1.2 cm. Among the lymph nodes of the left cervical region, 7 of 37 were involved. Her risk stratification for the prediction of persistent or recurrent disease before ^{131}I therapy was intermediate according to the 2015 American Thyroid Association (ATA) guidelines (8). The patient was in a state of euthyroidism, with a thyroid-stimulating hormone (TSH) level of 2.35 $\mu\text{IU/mL}$ (normal range, 0.27–4.20 $\mu\text{IU/mL}$), a free triiodothyronine 3 (FT3) level of 5.65 pmol/L (normal range, 3.10–6.80 pmol/L), and an FT4 level of 20.9 pmol/L (normal range, 12.0–22.0 pmol/L) before surgery. She was then admitted to our department for RT 4 weeks after surgery.

After withdrawing from thyroid hormone treatment for 3 weeks after thyroid surgery, the patient's serum thyroglobulin (Tg) level, serum antithyroglobulin antibody (TgAb) level, and TSH level was 14.00 $\mu\text{IU/mL}$ (reference range, 1.4–78 $\mu\text{IU/mL}$), 15.80 IU/mL (reference range, 0–115 IU/mL), and 47.800 $\mu\text{IU/mL}$, respectively. Four days after oral administration of 5.55 GBq (150 mCi) of ^{131}I , a whole-body planar scan showed two intense foci of ^{131}I : one in the thyroid bed (arrowhead, *Figure 1A,1B*) and the other in the chest with a heart-like pattern (arrows, *Figure 1A,1B*). Subsequently, single-photon emission computerized tomography and computed tomography (SPECT/CT) was performed, which revealed a lesion in the thyroid bed representing residual thyroid tissue and another in the pericardium, particularly in the superior pericardial recess (arrows in *Figure 1C-1E*) and the anterior inferior sinus of

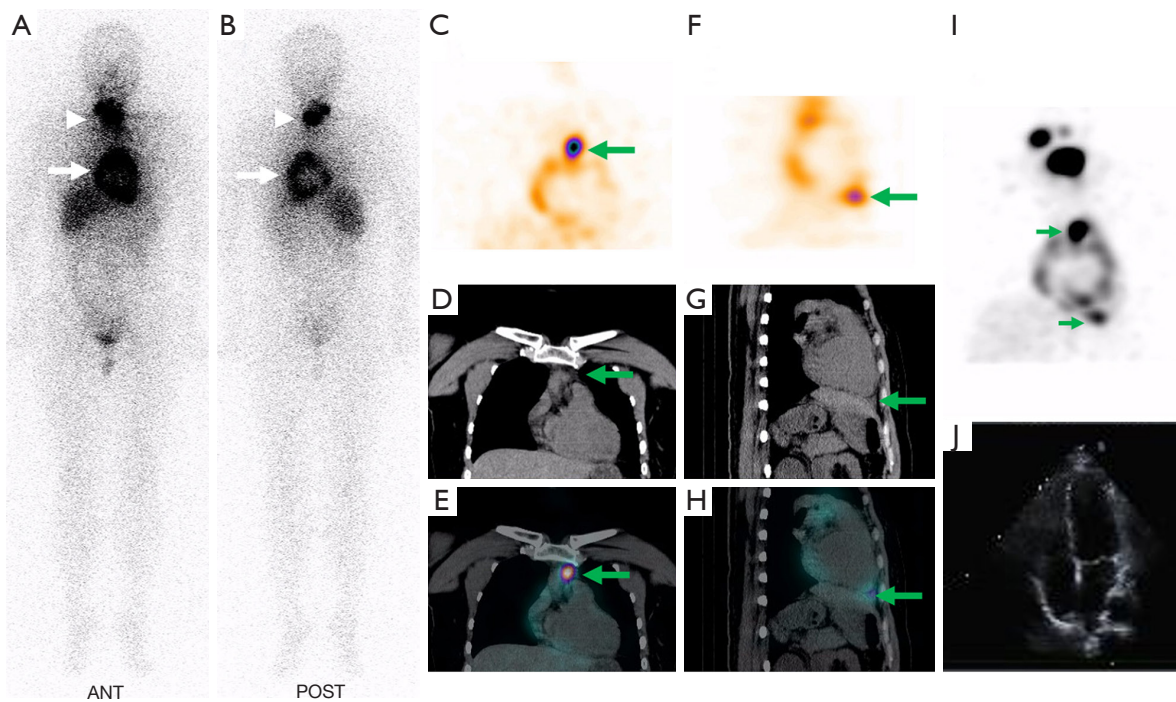


Figure 1 Posttherapeutic ^{131}I WBS and SPECT/CT findings. ^{131}I WBS showed two foci of ^{131}I (A,B, arrow and arrowhead; A: anterior view; B: posterior view). SPECT/CT was performed and revealed minimal pericardial effusion in the superior pericardial recess (C-E, arrows; SPECT: C; CT: D; SPECT/CT fusion: E) and the anterior inferior sinus of the pericardium (F-H, arrows; SPECT: F; CT: G; SPECT/CT fusion: H). In the maximum intensity projection image (I), heart-like pattern foci were observed in the pericardium, especially in the superior pericardial recess and anterior inferior sinus of the pericardium. After 5 days of levothyroxine therapy, the patient underwent echocardiography, which had normal findings (J). WBS, whole-body scan; SPECT, single-photon emission computed tomography; CT, computed tomography; ^{131}I , iodine-131.

the pericardium (arrows in *Figure 1F-1H*), with minimal pericardial effusion. The maximum intensity projection (MIP) image (*Figure 1I*) also showed heart-like pattern foci in the pericardium. After 5 days of levothyroxine therapy, the patient underwent echocardiography, which showed normal results (*Figure 1J*).

After 3 years of follow-up, there was no sign of metastatic or recurrent disease, her inhibitory Tg level was less than 0.04 ng/mL, the TgAb level was less than 10 IU/mL, and the imaging examinations were negative. Her echocardiography showed normal results. Therapeutic evaluation showed an excellent response from RT. She became pregnant and gave birth to a healthy baby 2 years after RT.

Discussion

^{131}I WBS is a highly sensitive method for detecting

metastatic or recurrent disease in patients with DTC (9). The correct interpretation of ^{131}I WBS is essential for the appropriate management of patients with thyroid cancer. The abnormal uptake outside the thyroid bed in ^{131}I WBS must be studied carefully, and the false-positive results of these findings need to be considered. Further imaging modalities are often required to explain the unexpected uptake of ^{131}I , but the lack of data for anatomical location on planar imaging protocols makes it difficult to direct further management. In this context, SPECT/CT is a highly valuable tool for determining the exact anatomic localization of the ^{131}I acid foci as detected on planar imaging protocols (10). Meanwhile, some studies have reported that SPECT/CT also has a higher sensitivity and specificity than ^{131}I WBS (11,12). In one study, the false-positive findings on ^{131}I WBS were categorized as physiological false-positive uptake, pathological false positive uptake, retention of ^{131}I , and contamination (1). For the retention of ^{131}I , it was

reported that pleural or pericardial effusions can accumulate ¹³¹I via the passive diffusion of ¹³¹I (13) or by partially active transport (14). There are some case studies and reviews of false-positive radioiodine uptake occurring due to the rapid development of pericardial effusion secondary to thyroid hormone withdrawal-related hypothyroidism (2-7). However, in other case studies, the radioiodine uptake was reported to be consistently faint or the volume of the pericardial fluid moderate or large. Our case indicated that an increase in ¹³¹I activity may not be associated with the volume of the pericardial fluid and that even minimal pericardial effusion may contribute to an extreme false-positive finding. Moreover, our case demonstrated that SPECT/CT imaging can be helpful for identifying the cause of increased activity due to its ability to clearly visualize pericardial effusion on the corresponding CT images.

Acknowledgments

We thank the patient and her family for their collaboration.
Funding: None.

Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://qims.amegroups.com/article/view/10.21037/qims-23-1375/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for the publication of this case report and accompanying image. A copy of the written consent is available for review by the editorial office of this journal.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the

original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Chudgar AV, Shah JC. Pictorial Review of False-Positive Results on Radioiodine Scintigrams of Patients with Differentiated Thyroid Cancer. *Radiographics* 2017;37:298-315.
2. Wang A, Fu W, Deng Y, He L, Zhang W. False-Positive ¹³¹I Uptake After Transareola Endoscopic Thyroidectomy in a Patient With Papillary Thyroid Carcinoma. *Clin Nucl Med* 2022;47:324-5.
3. Geatti O, Shapiro B, Orsolon PG, Mirolo R, Di Donna A. An unusual false-positive scan in a patient with pericardial effusion. *Clin Nucl Med* 1994;19:678-82.
4. Silva F, Garcia L, Flores C, Storer D, Aguiló F. Pericardial effusion. Unusual complication in thyroid cancer. *Clin Nucl Med* 1996;21:218-20.
5. Chou SL, Chern CH, How CK, Wang LM, Huang CI, Lee CH. A rare case of massive pericardial effusion secondary to hypothyroidism. *J Emerg Med* 2005;28:293-6.
6. Tan TH, Hassan SZ. A Rare Case of Isolated Pericardial Effusion Detected by SPECT/CT on a Post-Therapeutic Radioiodine Whole-Body Scan. *Nucl Med Mol Imaging* 2015;49:246-7.
7. Malhotra G, Moghe SH, Ranade R, Asopa RR. An Unusual False-Positive Uptake of Radioiodine in Pericardial Effusion on Posttherapy Scan. *Clin Nucl Med* 2016;41:568-9.
8. Haugen BR, Alexander EK, Bible KC, Doherty GM, Mandel SJ, Nikiforov YE, Pacini F, Randolph GW, Sawka AM, Schlumberger M, Schuff KG, Sherman SI, Sosa JA, Steward DL, Tuttle RM, Wartofsky L. 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. *Thyroid* 2016;26:1-133.
9. Chowdhary AW, Kavanal AJ, Sood A, Prashar S, Upadhyay R, Bhattacharya A, Mittal BR. Posttraumatic Scab on ¹³¹I Whole-Body Scan-A False-Positive Finding. *Clin Nucl Med* 2021;46:512-4.
10. Wang H, Fu HL, Li JN, Zou RJ, Gu ZH, Wu JC. The role of single-photon emission computed tomography/computed tomography for precise localization of metastases in patients with differentiated thyroid cancer.

- Clin Imaging 2009;33:49-54.
11. Spanu A, Solinas ME, Chessa F, Sanna D, Nuvoli S, Madeddu G. ¹³¹I SPECT/CT in the follow-up of differentiated thyroid carcinoma: incremental value versus planar imaging. *J Nucl Med* 2009;50:184-90.
 12. Chen L, Luo Q, Shen Y, Yu Y, Yuan Z, Lu H, Zhu R. Incremental value of ¹³¹I SPECT/CT in the management of patients with differentiated thyroid carcinoma. *J Nucl Med* 2008;49:1952-7.
 13. Shapiro B, Rufini V, Jarwan A, Geatti O, Kearfott KJ, Fig LM, Kirkwood ID, Gross MD. Artifacts, anatomical and physiological variants, and unrelated diseases that might cause false-positive whole-body ¹³¹I scans in patients with thyroid cancer. *Semin Nucl Med* 2000;30:115-32.
 14. Francese C, Schlumberger M, Travagli JP, Vera P, Caillou B, Parmentier C. Iodine ¹³¹I uptake in a pleuropericardial cyst: case report of a false-positive radioiodine total body scan result in a patient with a thyroid cancer. *Eur J Nucl Med* 1991;18:779-80.

Cite this article as: Han N, Zhang Y, Si Z, Wang G, Lu C, Wang X. Minimal pericardial effusion on iodine ¹³¹I whole-body scan could be a false-positive finding. *Quant Imaging Med Surg* 2024;14(2):2124-2127. doi: 10.21037/qims-23-1375