

# False-Positive Radioactive Iodine Uptake Mimicking Miliary Lung Metastases in a Patient Affected by Papillary Thyroid Cancer and IgA Deficiency

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**Abstract** A 42-year-old female with immunoglobulin A deficiency and recurrent sinopulmonary infections underwent thyroidectomy for papillary thyroid cancer (PTC). Follow-up <sup>123</sup>I scintigraphy demonstrated diffuse pulmonary uptake, suggesting metastatic disease. However, subsequent pathologic, biochemical and radiographic testing proved that she was in fact disease free, and the initial <sup>123</sup>I pulmonary uptake was identified as a false positive. Inflammatory conditions may rarely cause iodine uptake in non-thyroidal tissues due to local retention, organification, and/or immunologic utilization. To avoid exposing patients to unnecessary treatments, it is critical for clinicians to recognize that comorbid pulmonary conditions may mimic metastatic PTC on radioiodine scintigraphy.

**Keywords** Radionuclide imaging · Scintigraphy · Papillary thyroid carcinoma · False-positive reactions · IgA deficiency

A 42-year-old female, with a past medical history of IgA deficiency and recurrent sinopulmonary infections,

underwent total thyroidectomy for a 1.1-cm follicular variant PTC. Preoperative ultrasound (US) found no abnormal lymph nodes, and pathology demonstrated a well-differentiated unifocal cancer with no capsular or lymphovascular invasion. At 3-month follow-up, the rhTSH-stimulated Tg level was low at 1.7 ng/ml with negative Tg antibodies. However, the <sup>123</sup>I whole-body scan demonstrated focal increased uptake in the left thyroid bed and diffuse uptake in both lungs, suggestive of metastatic disease (Fig. 1a). At the time of testing, the patient was taking oral prednisone, inhaled mometasone/formoterol, and oral amoxicillin/clavulanate for a bronchitis flare. Given her conflicting results, the possibility of a false-positive radioiodine uptake result in the setting of active pulmonary inflammation was raised. In view of these findings, the patient was scheduled for <sup>131</sup>I dosimetry after levothyroxine withdrawal. Imaging at 48 h confirmed the thyroid bed findings, but the lungs had only minimal uptake (Fig. 1b). Labwork demonstrated an appropriately elevated TSH of 67.3 mIU/ml, with a low Tg of 4.6 ng/ml, and negative Tg antibodies. These results suggested that the initial pulmonary uptake was a false positive. The patient was subsequently treated with 100 mCi of <sup>131</sup>I. The post-treatment scan (Fig. 1c) confirmed the pretreatment findings.

At 1-year follow-up, the rhTSH-stimulated <sup>123</sup>I scan again showed faint diffuse uptake in both lungs. Stimulated Tg and Tg antibody levels were undetectable, neck US was negative for residual or recurrent disease, and CT of the lungs demonstrated bilateral bronchiectasis with no obvious metastatic lesions (Fig. 2). Thus, the persistent radioiodine uptake in the lungs was confirmed to be a spurious finding due to her underlying pulmonary disease rather than metastatic thyroid cancer.

Papillary thyroid cancer is the most common endocrine cancer in the US and accounts for almost 2,000 deaths

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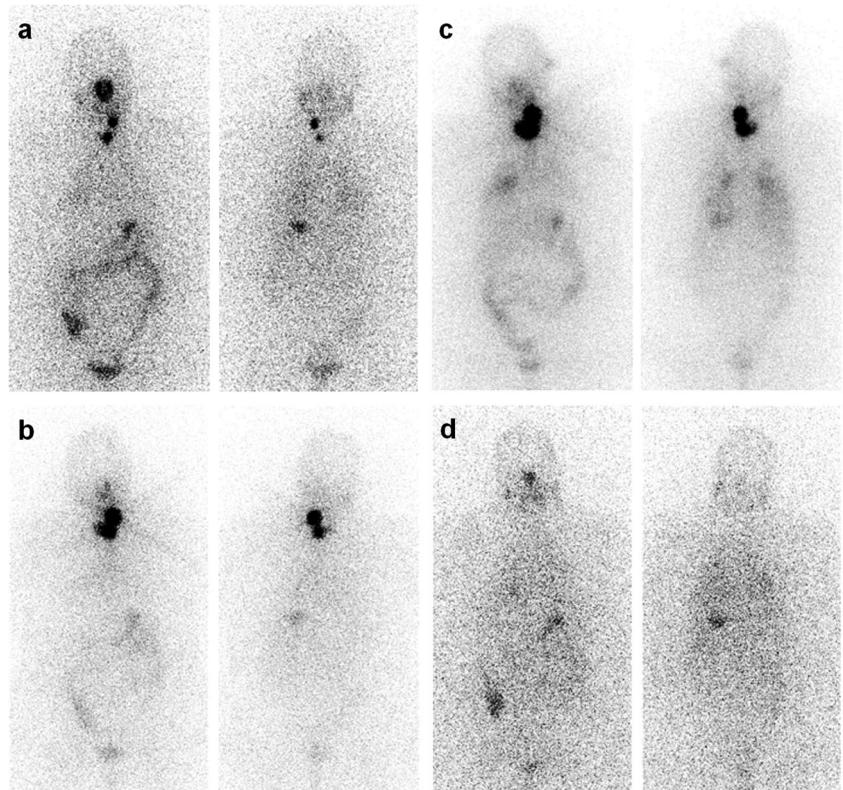
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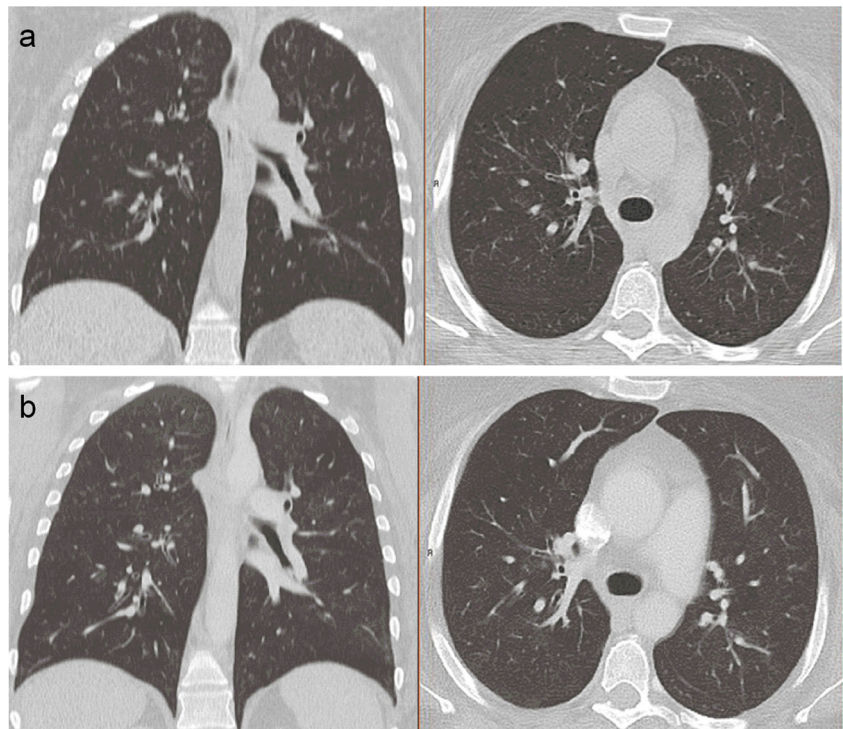
**Fig. 1** Serial radioactive iodine whole-body scans (WBS) from the anterior and poster views, respectively, of the: **a** initial diagnostic  $^{123}\text{I}$  WBS, **b** diagnostic 5 mCi  $^{131}\text{I}$  WBS used for dosimetry, **c** post-treatment  $^{131}\text{I}$  WBS, and **d** 1-year follow-up  $^{123}\text{I}$  WBS



annually [1, 2]. Radioactive iodine (RAI) is frequently used in the evaluation and treatment of PTC because of its high specificity for follicular thyroid cells. However, RAI uptake may mimic metastatic PTC in areas of inflammation or

infection [3, 4]. Inflammation is associated with increased vascular flow, capillary permeability, and stasis of radioiodine [3]. Also, leukocytes can induce iodide organification via myeloperoxidase enzymes, which likely

**Fig. 2** CT chest in coronal and axial reconstructions demonstrating persistent, chronic bilateral inflammation consistent with ground-glass infiltrates and mild bronchiectasis at the **a** initial and **b** 1-year follow-up visits. No suspicious metastatic lesions were seen in the corresponding areas of pulmonary radioactive iodine uptake



mimic thyroid peroxidation [5]. Moreover, recent studies have shown that iodide may play an important role in the innate immune system of the pulmonary tree by acting as a substrate for an oxidative microbicidal system [6, 7]. Iodine accumulation in bronchopulmonary secretions, while acting to defend against respiratory viruses and bacteria in inflammatory lung states [6–10], may also lead to false-positive post-RAI scans resulting in erroneous diagnoses.

Thus, the chronic bronchitis and bronchiectasis secondary to the IgA deficiency in our patient likely contributed to the spurious  $^{123}\text{I}$  scan findings. This case of IgA deficiency-related bronchitis masquerading as metastatic thyroid cancer emphasizes the need for vigilance when interpreting radioiodine scintigraphy in patients with comorbid pulmonary conditions.

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**Conflict of Interest** Andrew P. Demidowich, Amartya Kundu, James C. Reynolds, and Francesco S. Celi declare that they have no conflict of interest.

**Ethical Statement** The study was approved by an institutional review board or equivalent and has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All subjects in the study gave written informed consent or the institutional review board waived the need to obtain informed consent.

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