



Pleuropericardial Cyst Mimicking a Metastasis of Differentiated Thyroid Carcinoma on Whole-Body Iodine-131 Scan: a Case Report

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Abstract

Post-therapeutic whole-body scan (WBS) with I-131 has been widely used for the follow-up of patients with well-differentiated thyroid cancer (DTC). Although the sensitivity of WBS with I-131 in detection of functioning thyroid tissues is high, its specificity is low. So, a further evaluation is required in cases of unexpected findings. The purpose of the study was to demonstrate that awareness of the potential pitfalls of WBS in DTC, knowledge of physiology and characteristics of radioiodine uptake, and correlation with other imaging modalities are needed to avoid incorrect management of patients with DTC. This is a case report of a 49-year-old woman with an unexpected area of increased I-131 uptake in the posterior lower chest, which was finally diagnosed as a pleuropericardial cyst. Due to the false-positive uptake of I-131 in the chest, an accurate interpretation of the scintigraphic findings should be made.

Keywords Post-therapeutic whole-body scan (WBS) with I-131 · DTC · CT · MRI

Introduction

Post-therapeutic I-131 whole-body scan (WBS) has been widely accepted as an important imaging tool in the management of patients with well-differentiated thyroid

cancer (DTC). It is performed several days after radioiodine therapy, in order to detect, confirm, or exclude functioning thyroid remnants or distant metastasis. An uptake of I-131 in an unexpected area is strongly suggestive of a distant functioning metastasis [1]. Although the detection ability of post-therapeutic WBS is high, a relative high percentage rate of false-positive findings has been reported in the literature. Recognition of multiple causes of false-positive findings will prevent misinterpretations [2].

We describe a case of radioiodine uptake on post-therapeutic I-131 WBS in a woman with DTC which was falsely interpreted as distant metastasis. The final diagnosis was a pleuropericardial cyst.

Case Report

A 49-year-old woman with a history of thyroidectomy due to a papillary thyroid cancer (stage T3N0M0, mixed oncocytic variant status and thyroid capsule invasion) was referred to our department for radioiodine therapy (RAI). The patient received 120 mCi I-131 after thyroid hormone withdrawal. Laboratory findings showed serum levels of TSH 39 mIU/L, thyroglobulin (TG) 3.26 (normal range 1.6–55), and antibodies (anti TG) 0.1. A

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detailed history revealed only mild, non-productive, chronic cough.

A post-therapeutic WBS was obtained, as a baseline, a week after the therapeutic procedure. A large field of view γ camera (Philips Forte Jet stream) with a high-energy parallel-hole collimator was used. Anterior and posterior views of the whole body were obtained. In our case, a mild diffuse activity in the liver, associated with metabolism of radioiodinated thyroid hormones and an intense uptake in the area of thyroid bed, which was suggestive of the remnant thyroid tissue, was observed. Additionally, a mild focal accumulation of radioiodine in the posterior lower chest, to the left of midline, was seen (Fig. 1). In order to exclude any artifact of esophageal retention or sweat contamination, additional delayed posterior and lateral images were obtained after drinking water and wearing clean clothes. No change of the finding was observed (Fig. 2). A further diagnostic work up, to obtain an accurate diagnosis among hiatal hernia, Barrett's esophagus, pulmonary lesion, or cystic masses of the mediastinum (bronchogenic cysts, meningocele, thymic cysts, esophageal duplication

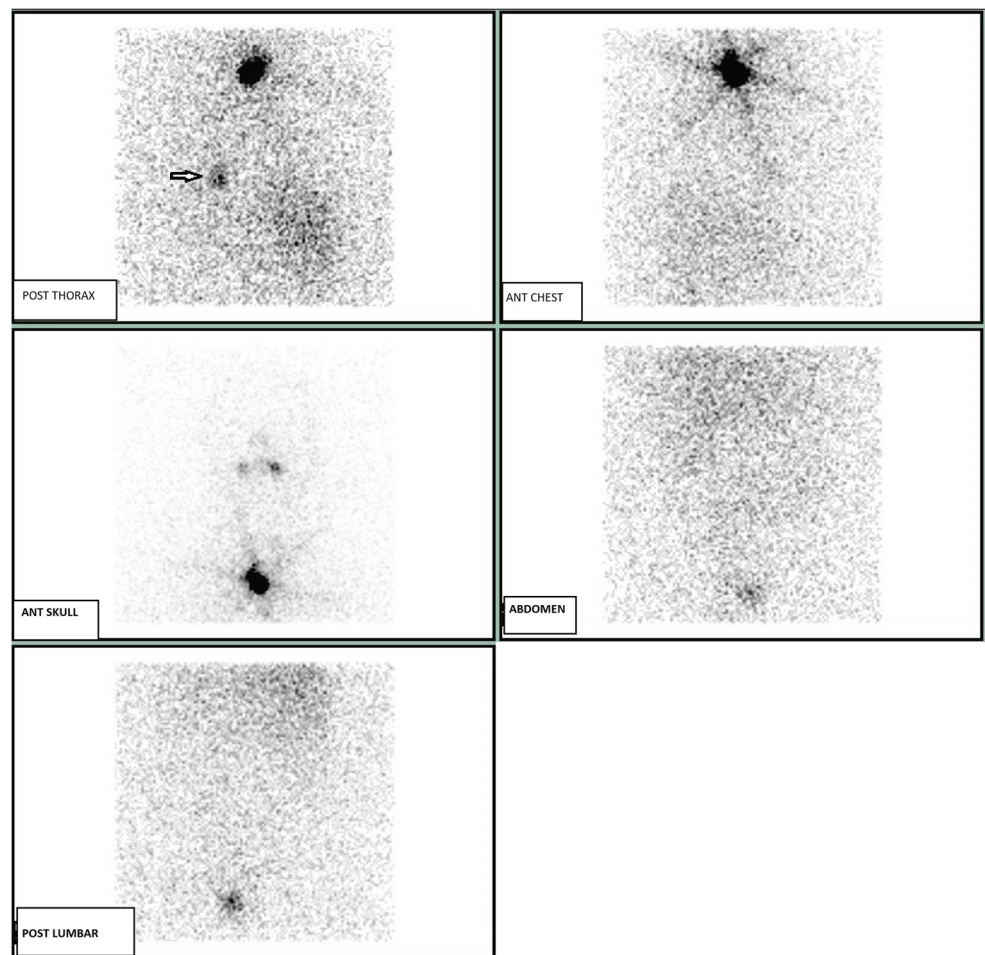
cysts, neurenteric cysts, pericardial cysts, cystic teratoma, lymphangioma), was recommended [3].

A thorax computed tomography (CT) revealed an ellipsoid, $2.3 \times 2.3 \times 2.5$ -cm well-defined cystic-like lesion in the left pleuropericardial angle with no enhancement after intravascular administration of contrast material, attenuation characteristics suggestive of a cystic lesion (Fig. 3a, b).

A subsequent magnetic resonance imaging (MRI) of the thorax revealed a cystic, well-defined, bordered by a thin wall, lobulated mass of $23 \times 23 \times 25$ mm, in contact with the left cardiac atrium, esophagus, and descending aorta. On fat-saturated T2-weighted image, fatty content was excluded and diffusion-weighted imaging (DWI) confirmed no restriction of the diffusion (Fig. 4a–c). On T1-weighted image, there was no contrast enhancement of the lesion (Fig. 5a–c).

The final diagnosis corresponding to the abnormal finding on I-131 WBS was a left pleuropericardial cyst. A conservative treatment and follow-up with chest CT were recommended. No surgery was recommended because of the small size of the cyst and the absence of clinical complications, such as cyst rupture or cardiac tamponade.

Fig. 1 I-131 WBS: mild focal radioiodine uptake in the posterior lower chest, to the left of midline (arrow)



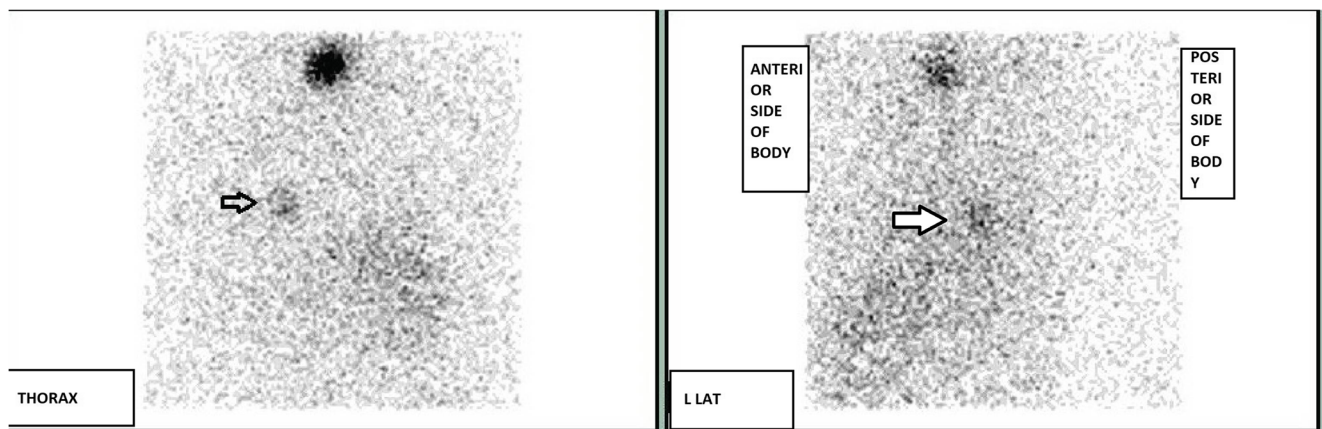


Fig. 2 I-131 WBS: delayed posterior and lateral images: no change of the finding (arrow)

Discussion

DTC is a malignant tumor, associated with high survival rates and relatively low mortality. Thyroidectomy with lymph node dissection, followed by radioiodine therapy with I-131 (RAI), where is indicated, promises good patient prognosis.

RAI has been used for more than 50 years in patients with well DTC. A post-therapeutic I-131 WBS is usually performed within 5th to 10th day after RAI, in order to detect normal thyroid remnants and recurrent or metastatic disease. The key mechanism of radioiodine uptake in thyroidal tissues, in normal or ectopic positions, occurs via the sodium iodine symporter (NIS), an active, energy-requiring process [1].

Physiological uptake of I-131 can be observed in a variety of non-thyroid tissues such as choroid plexus, lacrimal sac, nasopharynx, salivary glands, oral cavity, thymus, esophagus, hiatal hernia, stomach, breast, liver, cysts, and vascular dilations due to functional NIS expression, metabolism of thyroid hormones, and retention of excreted iodine [2].

The radioiodine uptake in a pleuropericardial cyst is not a common finding on WBS. Only two cases of pleuropericardial cysts with I-131 uptake have been described in the literature until

now [4, 5]. It is believed that entry of radioiodine into various cystic structures, including the pleuropericardial cysts, occurs via passive diffusion from the extracellular liquid into the cyst cavity or via partially active transport by epithelial cells lining the cyst. It is thought that I-131 is trapped within the cysts due to the slow exchange of water and chemical elements between the cysts and their surrounding environment [2, 6].

Pleuropericardial cysts are a rare entity, comprising 7% of mediastinal masses and 33% of mediastinal cysts. Usually, they are an incidental finding in the chest X-ray, in the third or the fourth decade of the life. The majority of pleuropericardial cysts are found in the anatomical region of the right cardiophrenic angle.

They are usually congenital in origin and probably are a remnant of a diverticulum whose communication with the pericardial cavity has been obliterated. Other causes of arising a pleuropericardial cyst include inflammation (rheumatic, pericarditis, bacterial infection, echinococcosis), trauma, and cardiac surgery. Cysts are lined by endothelial-like cells and the wall itself is made up of poorly defined fibrous tissue.

Most patients have no symptoms. Symptoms may appear in case of compression the nearby structures and include

Fig. 3 **a** Contrast-enhanced axial CT: well-demarcated ellipsoid lesion between the left atrium and the descending aorta (arrow). **b** Coronal contrast-enhanced CT: the mass shows no enhancement and the attenuation characteristics of this mass are indicative of a cystic lesion (arrow)

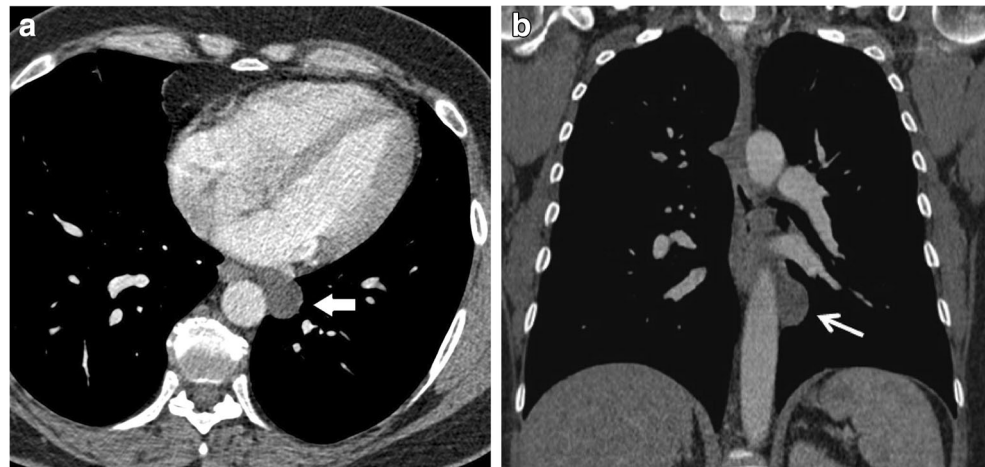
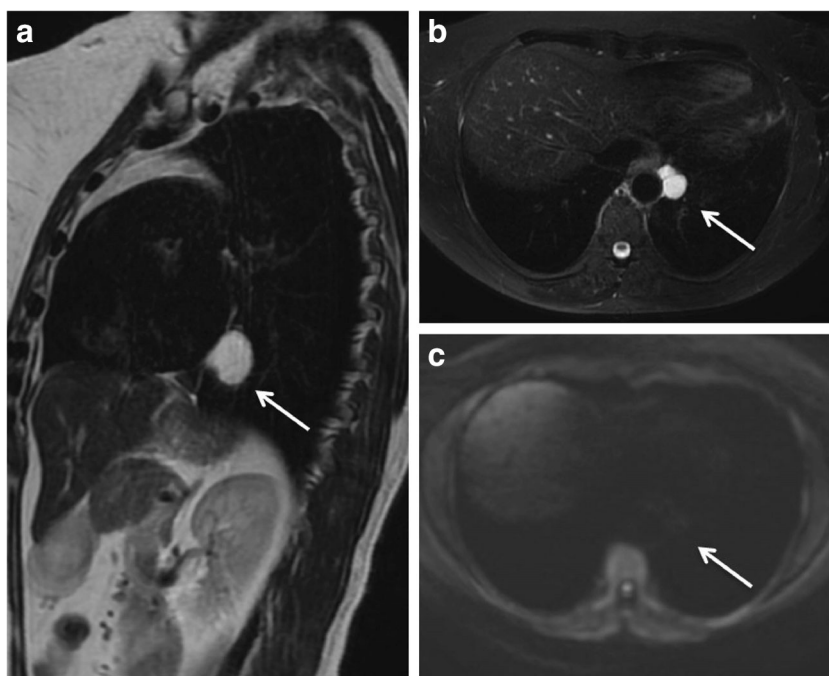


Fig. 4 **a** MRI: sagittal T2-weighted image shows a well-defined, thin-walled, lobulated lesion (arrow) in contact with the left atrium and the descending aorta. **b** MRI: axial fat-saturated T2-weighted image: fatty content can be excluded (arrow). **c** MRI: axial DWI: no restriction of the diffusion (arrow)



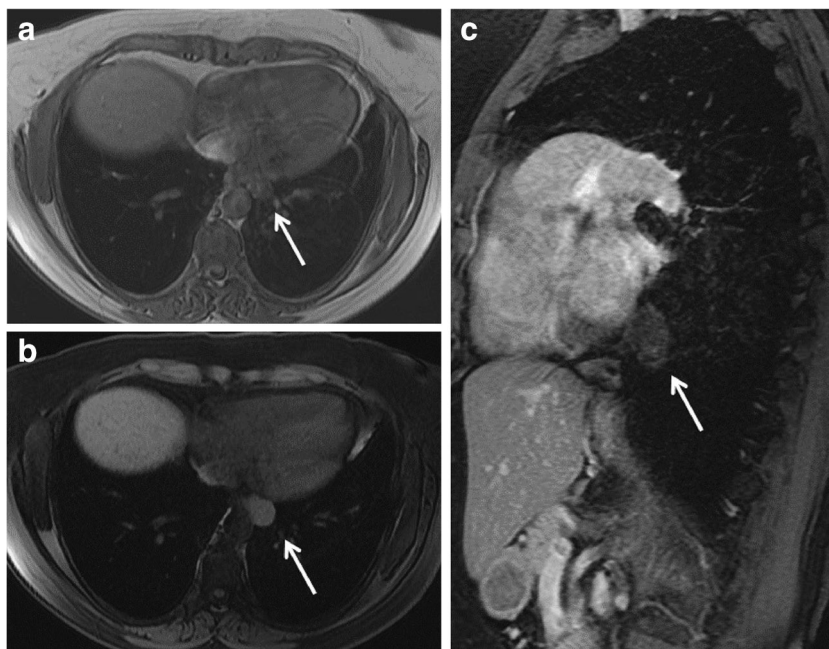
chronic cough, chest pain, and dyspnea. Unusual clinical presentations include palpitations, recurrent pneumonia, and sudden cardiac death [7, 8].

Imaging modalities have an important role in the diagnosis of a pleuropericardial cyst. CT is considered as the best modality. Moreover, MRI is useful in cases with diagnostic dilemmas, and echocardiography is preferred in asymptomatic patients avoiding the unnecessary radiation exposure. In our case, the radiological evidence for the final diagnosis being made to cyst is based on several findings: (a) there was no

enhancement after intravascular administration of contrast material on CT and (b) on fat-saturated T2-weighted image on MRI, fatty content was excluded and diffusion-weighted imaging (DWI) confirmed no restriction of the diffusion. The therapeutic management of patients with pleuropericardial cysts is conservative. Excision of cyst should be kept in mind in case of appearance of symptoms, cyst enlarging in size, infection, or any complication [3].

False-positive I-131 WBS findings must always be kept in mind. And Radioiodine uptake should be evaluated carefully

Fig. 5 **a** MRI: low signal intensity on axial T1-weighted (arrow). **b** MRI: mild increased signal intensity on fat-suppressed spoiled GRE T1-weighted image due to elevated protein content (arrow). **c** MRI: no contrast enhancement of the septa- or the content on sagittal post-contrast fat-suppressed T1-weighted image (arrow)



because misinterpretation of the WBS may lead to mistaken diagnosis of metastases or recurrence of thyroid cancer [9–12].

Hybrid imaging SPECT/CT, performed on determinate areas indicated from WBS, provides useful and accurate additional anatomical information and improves the low specificity of I-131 WBS [6, 13]. SPECT/CT was not performed due to the unavailability in our department. The diagnosis was given by diagnostic CT and subsequent MRI suggesting that our finding was consistent with a left pleuropericardial cyst.

In conclusion, many cases of false-positive radioiodine accumulation in the WBS have been reported in the literature. Careful history and accurate interpretation of the scintigraphic findings are critical in the management of patients with thyroid cancer. In difficult interpreted cases, other imaging modalities should be considered.

Compliance with Ethical Standards

Conflict of Interest Olga Bourogianni, Konstantinos Pagonidis, Maria Stathaki, Angeliki Tsaroucha, Emmanouela Papadaki, and Sophia Koukouraki declare that they have no conflict of interest.

Ethical Approval All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from the subject of this case report.

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