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False Positive Uptake of I-131 in a Case of Hemangioma Mimicking as Bone Metastasis

Singh V, Jain B*, Ora M and Kumar PK

Department of Nuclear Medicine, SGPGIMS, Lucknow, India

*Corresponding author: Jain B, Department of Nuclear Medicine, Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), New PMSSY Road, Raibareli Rd, Lucknow-226014, Uttar Pradesh, India.

Tel: +91-9458289669; E-mail: bela1102@yahoo.in

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Abstract

Thyroid carcinoma is treated by near-total or total thyroidectomy, followed by ^{131}Iodine (^{131}I) ablation of any remnant thyroid tissue. ^{131}Iodine whole-body scan (WBS) has been used for the follow-up of differentiated thyroid carcinoma for several decades. The specificity of the ^{131}I whole-body scan for detecting residual, metastatic, and recurrent differentiated thyroid carcinoma is reported to be higher than 90%. However, radioiodine uptake is not specific to thyroid tissue. It could also be observed in various physiological and pathological conditions that could be mistaken for metastasis. Therefore, a thorough understanding of radioiodine physiology and biodistribution is critical when interpreting radioiodine scintigraphic studies to avoid misinterpretation of the various variants as thyroid cancer metastases. Here we present a papillary carcinoma case treated with ^{131}I following total thyroidectomy and showing uptake of ^{131}I in vertebrae on follow-up whole-body radioiodine scintigraphy mimicking as bone Metastasis, which was later found to be a hemangioma.

Abbreviations

I-131: Iodine 131; WBS: Whole Body Scan; SPECT: Single-Photon Emission Computed Tomography; CT: Computed Tomography; TFT: Thyroid Function Tests; USG: Ultrasonography; FNAC: Fine Needle Aspiration Cytology; PCT: Papillary Carcinoma of Thyroid; Tg: Thyroglobulin; Atg: Antithyroglobulin; Bq: Bequerel; mCi: mili Curie.

Introduction

Iodine-131 (I-131) whole-body scan (WBS) plays an essential role in the management of patients with differentiated thyroid carcinoma (DTC) to detect normal thyroid remnant and recurrent or metastatic disease [1]. A focus of ^{131}I accumulation outside the thyroid bed and physiological uptake areas is strongly suggestive of distant functioning metastasis [2]. However, many false-positive ^{131}I WBS findings have been reported in the literature. Although being a sensitive marker for the detection of thyroid cancer, Radioiodine is not specific for thyroid tissue [3]. Apart from thyroid, uptake can also be seen in including thymus [4], liver, gastrointestinal tract, nasal activity, lactating breasts, Zenker's diverticulum, and Meckel's diverticulum or benign diseases, such as hiatal hernia [5], inflammatory lung disease, sialadenitis, cysts, and inflammation or in a variety of benign and malignant non-thyroidal tumors, which could be mistaken for thyroid carcinoma [2,6,7].

Therefore, a thorough understanding of radioiodine physiology and biodistribution is critical when interpreting Radioiodine

scintigraphic studies to avoid misinterpretation of physiologic and pathologic variants as thyroid cancer metastases. The interpretation of Radioiodine scintigraphic studies should be performed in conjunction with a comprehensive history, histopathologic correlation, pertinent blood parameter values, and correlation with available anatomic images and the physical examination findings.

Differentiating a false-positive finding from a metastasis on pretherapy radioiodine scintigrams is essential to determine the appropriate radioiodine treatment dose. The correct interpretation of post-therapy Radioiodine scintigraphic studies is also essential to determine if repeated radioiodine doses are required and for the patient's future clinical and imaging follow-up [8].

Quite a few false-positive findings have been reported in the literature. They are further demonstrated with SPECT/CT hybrid imaging (single-photon emission computed tomography SPECT integrated with computed tomography).SPECT/CT has improved the prognostic value of planar radionuclide techniques as it evaluates morphological and functional information together. The use of SPECT/CT significantly increases the diagnostic accuracy of planar scintigraphy. SPECT/CT has been documented to be of supplementary value in the accurate anatomic localization and characterization of radioiodine uptake as false-positive findings, particularly in cases with incongruous findings of a low serum thyroglobulin level but positive findings on Radioiodine whole-body planar scintigram [8].

Case Presentation

A 40-year-old female patient presented with a complaint of anterior neck swelling for three years. After further routine investigations (TFT, USG, FNAC), a diagnosis of papillary carcinoma of the thyroid (PCT) was made, for which the patient underwent total thyroidectomy. The final histopathology report confirmed it to be a case of PCT. The patient was referred to our department for a radioactive iodine scan and further treatment. After two months, the patient was scheduled for follow-up in our department with the advice to stop thyroxine one month before the visit. On the follow-up day, blood parameters included TSH- > 150 micro IU/ml, Serum thyroglobulin (S.Tg) – 0.3, Anti Thyroglobulin (Atg)- 109.4 IU/ml. A whole-body radioiodine scan was done, planar images showed uptake in the thyroid bed only. SPECT/CT of neck and thorax confirmed it to be thyroid bed uptake (Figure 1). There is no other uptake anywhere else in the body.

The patient was treated for remnant with 1850 Bq (50 mCi) of ^{131}I orally under medical supervision. The post-therapy scan showed similar uptake as the pre-therapy scan. After ^{131}I therapy patient started on thyroxine and was further scheduled for follow-up after six months with advice to stop Thyroxine a month before. Follow-up whole-body radioiodine scan after six months revealed a suspicious focus of mildly increased uptake in the upper thorax; however, values of serum Tg and ATg showed a decreasing trend (S.Tg < 0.2, ATg-16.4). SPECT/CT of the suspected region was done, which revealed mild uptake in the first thoracic vertebra. CT scan of the neck and upper thorax was consistent with hemangioma in the body of the first thoracic (D1) vertebra (Figure 2 and 3). On looking at the whole scenario, the uptake on the ^{131}I scan was considered false-positive uptake in haemangioma. The patient is on regular follow-up in our department and is presently asymptomatic & disease-free.

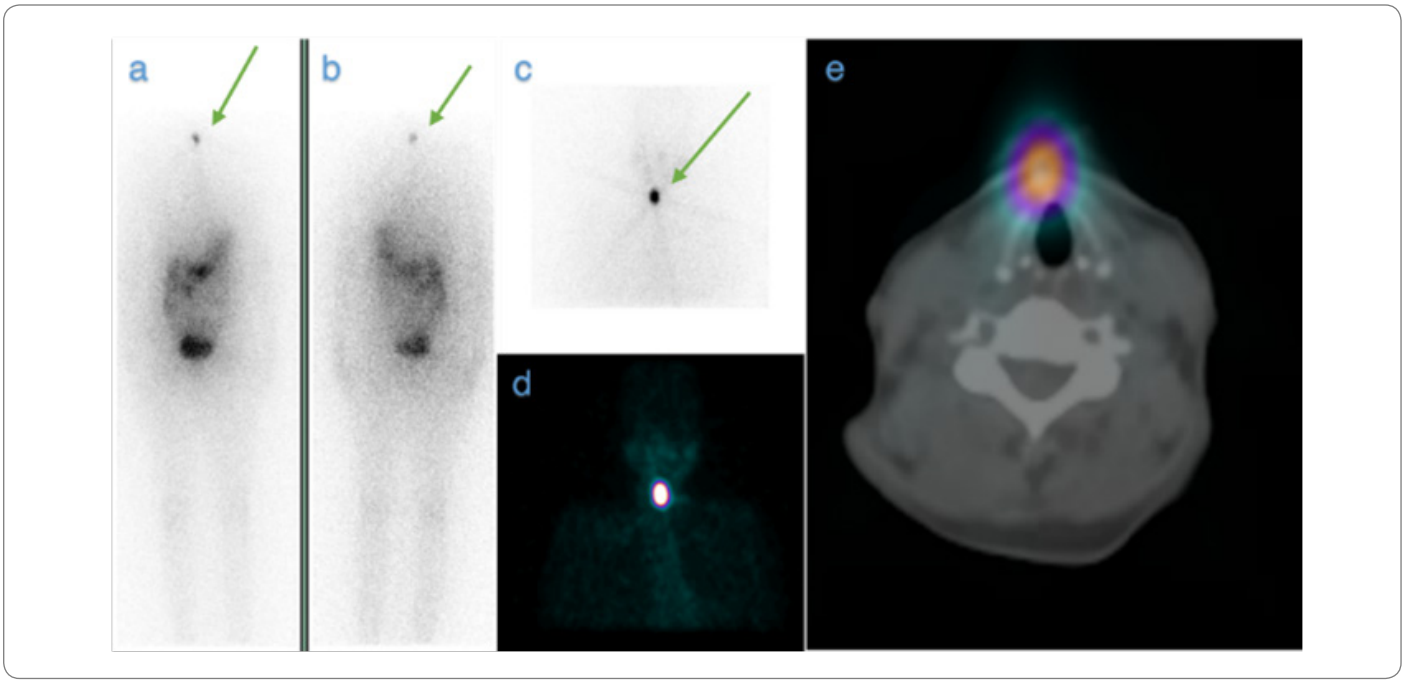

Figure 1: 1st ^{131}I whole body scan of patient; planar images revealed physiological tracer uptake in stomach, intestine with focal ^{131}I uptake at level of neck in anterior. **(a)** and posterior. **(b)** view. High count spot anterior view revealed uptake in neck. **(c)** SPECT MIP image confirmed ^{131}I uptake in thyroid bed which is further confirmed by Fused SPECT/CT images to be a remnant thyroid bed uptake **(e)**.

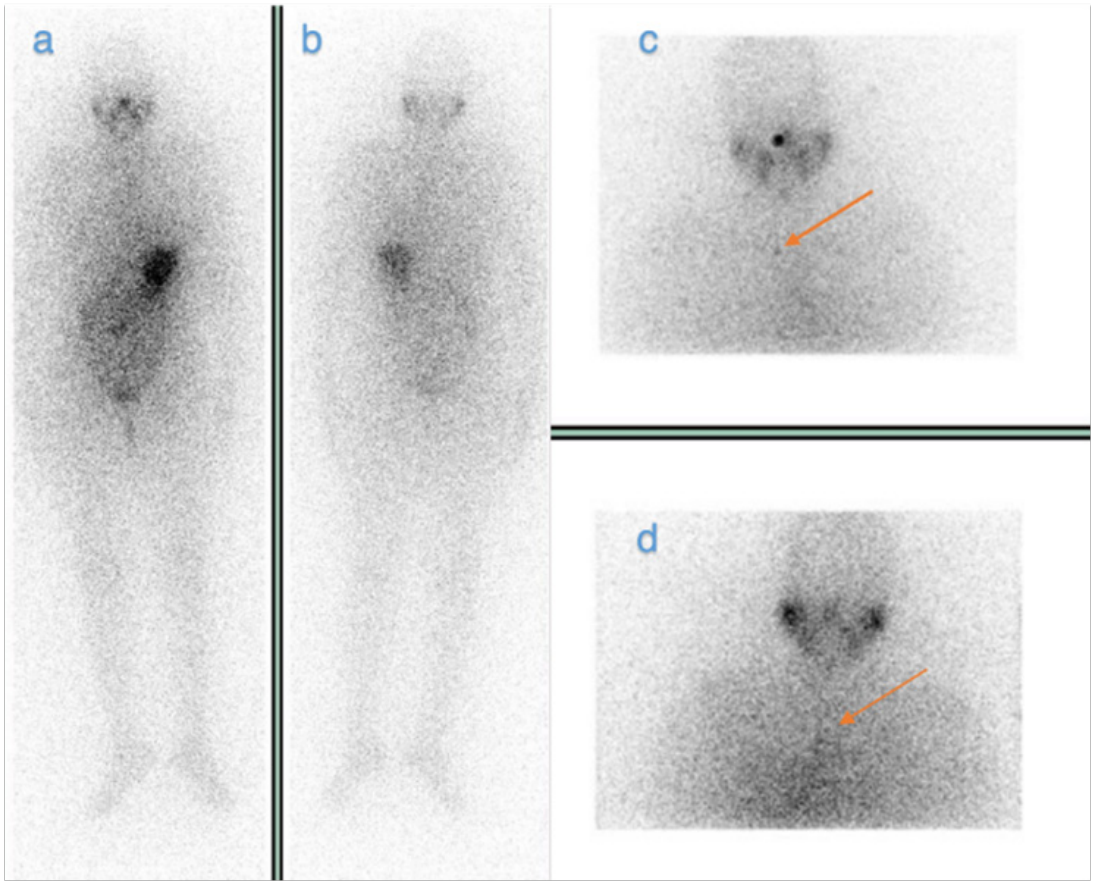

Figure 2: Planar whole-body radioiodine scan of the patient on follow-up. **(a)** whole body anterior view. **(b)** posterior view. **(c)** High count spot anterior view. **(d)** high count spot posterior view, which revealed physiological tracer uptake in salivary glands, stomach and intestine with the suspicious area of increased ^{131}I uptake in anterior and posterior spot views(arrow mark).

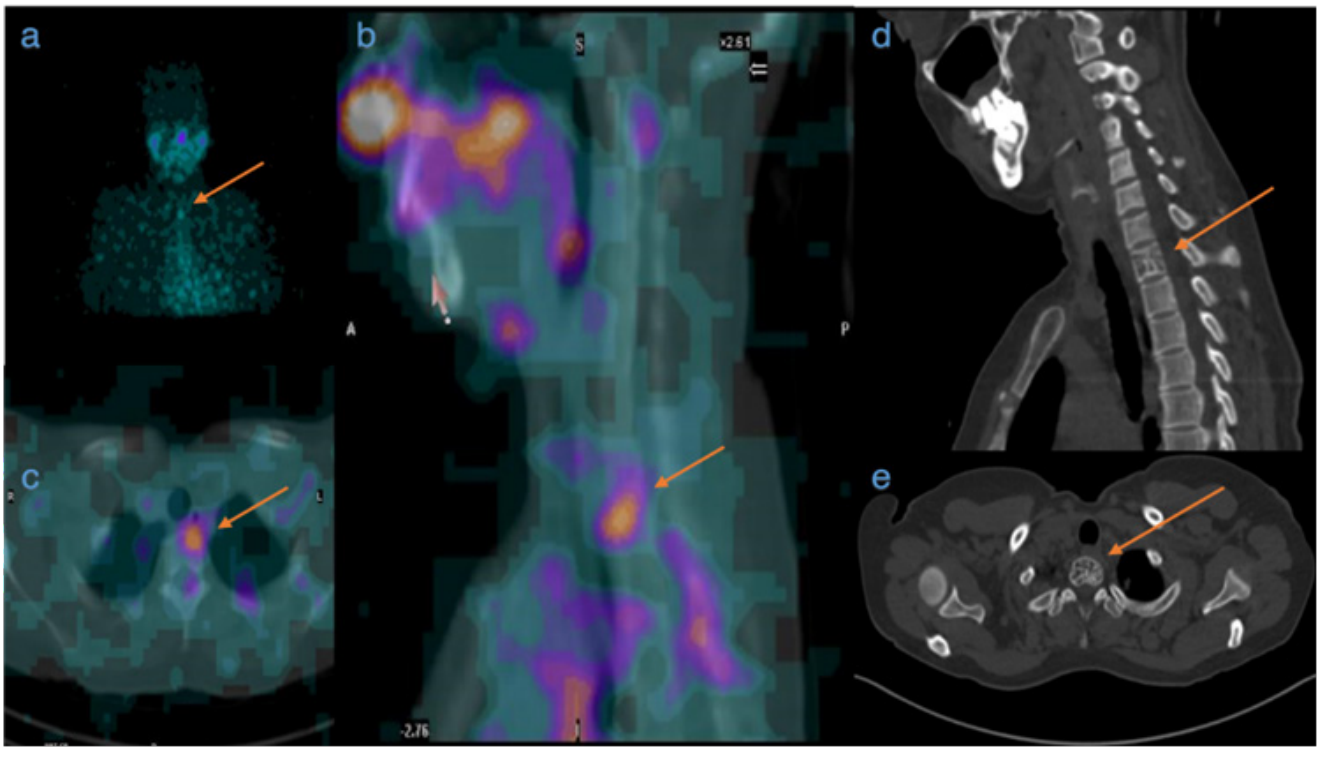

Figure 3: SPECT and fused SPECT/CT images of corresponding lesion **(a, b, c)** low dose CT images of corresponding lesion. **(d, e)**. MIP SPECT image reveal ^{131}I uptake in upper thorax. **(a)** SPECT image of sagittal and axial section confirms ^{131}I uptake in D1 vertebrae **(b, c)**; CT Sagittal section of D1 vertebrae reveal corduroy. **(d)** and polka dot appearance of D1 thoracic vertebrae. **(e)** consistent with haemangioma.

Discussion

Thyroid carcinoma requires a multidisciplinary approach for its management. Nuclear medicine and radioactive iodine, in particular, have been deterministic in the diagnosis and treatment of differentiated thyroid carcinoma. Papillary carcinoma, the most common among all thyroid cancers, is increasing in incidence around the world [9]. Differentiated Thyroid Cancer (DTC) is a malignant tumor, with a favorable prognosis and low mortality, compared with most other malignancies [10].

Several false-positive findings have already been reported; Benign hemangiomas are one of them. Vertebral hemangiomas are common benign vascular tumors of the spine, with an incidence of 10%–12%, more common in the thoracic spine. They are usually asymptomatic and are diagnosed incidentally. Occasionally, symptoms are manifested due to pressure effects on the surrounding structures or the vertebral body's destruction [11]. The characteristic histopathological pattern is thin-walled, blood-filled vessels and sinuses lined by endothelium and interspersed among the bones' longitudinally orientated trabeculae [12]. Due to this structural arrangement, vertebral hemangiomas appear 'Corduroy' in sagittal sections and 'polka dot appearance' in axial images [13]. False-positive uptake of ^{131}I in a case of hemangioma could be due to intravascular blood pooling and transcapillary escape of iodine with interstitial retention, as suggested by previous reports [14,15]. Therefore clinical, biochemical, functional, and anatomical correlation should also be emphasized before making therapeutic decisions. The presence of metastatic bone disease can have significant consequences in the treatment, course, and prognosis of the disease; hence, a bony lesion's detailed evaluation is essential. This case report highlights the use of nuclear medicine modalities in detecting false-positive uptake of ^{131}I to avoid additional costly investigations and unnecessary surgery or exposure to further radiation from repeated therapeutic doses of ^{131}Iodine.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Informed consent was obtained for this publication.

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