Incidentally polycystic kidney disease identified by SPECT/CT with post-therapy radioiodine scintigraphy in a patient with differentiated thyroid carcinoma
A case report
Yan-Xia Mi, MDa, Xin Sui, MD, PhDb, Jian-Min Huang, MDc, Ling-Ge Wei, MD, PhDc, Peng Xie, MD, PhDc,*

Abstract
Rationale: Post-therapy or diagnostic whole-body radioiodine scintigraphy is widely employed to evaluate the residual, recurrence, or metastases of differentiated thyroid carcinoma because of the high sensitivity and accuracy. However, it has pitfalls.

Patient concerns: We described a 63-year-old male with a history of papillary thyroid carcinoma who was referred for iodine-131 ablation therapy. The post-therapy iodine-131 whole-body images demonstrated abnormal increased uptake of the tracer in the regions of bilateral upper abdomen.

Diagnoses: The single photon emission computed tomography/computed tomography (SPECT/CT) showed the abnormal activity (Fig. 1) demonstrated intense radioiodine uptake in the regions of bilateral upper abdomen.

Interventions and outcomes: The patient responded well to the lifestyle-based treatments.

Lessons: Polycystic kidney disease was one of the etiologies of the false-positive findings in the radioiodine scintigraphy.

Abbreviations: SPECT/CT = single photon emission computed tomography/computed tomography, NIS = Na+/I- symporter, PKD = polycystic kidney disease.

Keywords: case report, polycystic kidney disease, radioiodine, thyroid carcinoma

1. Introduction
Radioactive iodine therapy has been widely used over the past 70 years for the ablation of normal remnant tissue following thyroidectomy and for the treatment of metastatic differentiated thyroid carcinoma. Furthermore, post-therapy or diagnostic whole-body radioiodine scintigraphy is extensively employed to evaluate the residual, recurrence, or metastases of differentiated thyroid carcinoma because of the high sensitivity and accuracy.

However, it has pitfalls. In order to avoid unnecessary therapeutic interventions, it is important to distinguish false-positive uptake of iodine-131. Some literatures concerning false-positive uptake of iodine-131 have been reported.[2–8] However, radioiodine accumulation in polycystic kidney disease was extremely rare. We present a case of the abnormal radioiodine uptake due to polycystic kidney disease in the radioiodine scintigraphy.

2. Case presentation
A 63-year-old male was hospitalized because of the iodine-131 ablation therapy. Past history taking revealed that he had undergone total thyroidectomy due to thyroid multifocal nodules about 1 month ago, and the diagnosis of papillary thyroid carcinoma was confirmed by pathology. Laboratory tests revealed elevated level of serum thyroglobulin (2.4ng/mL, normal range: 0.3–5.2ng/mL), low level of serum thyrotropin (4.2mIU/mL, normal range: 0.3–5.0mIU/mL), and low level of serum thyrocalcitonin (12.4pg/mL, normal range: 4.0–40.4pg/mL).

Copyright © 2017 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-NDA), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Medicine (2017) 96:43(e8348)
upper abdomen was noted with unknown etiology (arrows). To identify the essence of the increased activity in the bilateral upper abdomen, a single photon emission computed tomography/computed tomography (SPECT/CT) was acquired from the upper to the lower abdomen. The SPECT/CT images (Fig. 2) revealed that the 2 foci of elevated activity in the regions of bilateral upper abdomen were corresponded to multiple irregular cystic low densities in the bilateral kidney on the low-dose CT images and the diagnosis of polycystic kidney disease was confirmed (arrows). Because of no symptom, lifestyle-based treatments were administered including blood pressure control, exercise, low-salt diet, and high volume water intake. The patients responded well to the treatment.

The patient-written informed consent was waived due to the retrospective nature of the presented case. Patient information was anonymized and deidentified.

Figure 1. The post-therapy radiiodine scintigraphy images demonstrated intense radiiodine uptake in the region of neck, which was suggestive of the remnant thyroid tissue. There was diffuse increased activity in the region of liver, which was likely associated with the thyroid remnant. Unexpectedly, increased activity in the regions of bilateral upper abdomen was noted with unknown etiology (arrows).

Figure 2. SPECT/CT images revealed that the 2 foci of elevated activity in the regions of bilateral upper abdomen were corresponded to multiple irregular cystic low densities in the bilateral kidney on the low-dose CT images and the diagnosis of polycystic kidney disease was confirmed (arrows). CT = computed tomography, SPECT/CT = single photon emission computed tomography/computed tomography.

3. Discussion

On the iodine-131 whole-body images, some radioactivity accumulation can be frequently observed in the regions of the nasopharynx, salivary glands, stomach, breasts, liver, bowels, and bladder, which may be related to the expression of Na+/I⁻ symporter (NIS) and the excretion of the radiiodine. NIS is responsible for the active transport of iodine in the thyroid gland. It is present in other tissues including salivary and lacrimal glands, gastric mucosa, and lactating mammary gland, and in all the tissues where the NIS is functional. So it is important to distinguish the nonpositive uptake when we interpret the radiiodine scintigraphy images.

Polycystic kidney disease (PKD), also known as polycystic kidney syndrome, defined by the presence of multiple kidney
cysts, is a genetic disorder in which the kidney cysts develop and grow at any point. In this study, there was relatively symmetrical activity in both the sides of the PKD. Although the exact mechanism of this phenomenon is unclear, it may be similar to that of renal cysts. One possible reason is that there is a communication between the renal cyst and the collecting systems of kidney. Another is due to NIS, which promotes iodine transport in the thyroid, has recently been found in renal tissue.

It is true that the diagnosis of PKD is mainly made by CT or ultrasound and the renal cysts sometimes accumulate I-131. However, the literature was published in 1988 when there was no SPECT/CT in the world, which led to the fact that the association between the accumulation of I-131 and the renal cyst was not precise and immediate. In this paper, the relationship of PKD and the accumulation of I-131 could be established definitely on the images of SPECT/CT. Furthermore, although there is much in common between the renal cyst and PKD, they are very different disease with different therapy and prognosis. Based on the above words, we do believe that this finding would provide great help to the patient and also provide important etiology of the false-positive findings in the radioiodine scintigraphy.

To avoid unnecessary treatment, false-positive findings in the study of radioiodine scintigraphy must be accurately distinguished. The combination of radioiodine scintigraphy and SPECT/CT in differentiated thyroid cancer patients can be of great help to evaluate the residual, recurrence, or metastases of differentiated thyroid carcinoma accurately. Although nobody would take the I-131 accumulations in the PKD as metastatic lesions on the images of SPECT/CT, on the planar images it is very important to interpret the findings in the region outside neck. In clinical practice, the post-therapy whole-body radioiodine planar scintigraphy is used routinely, but the SPECT/CT is not necessary for all the patients. The current study highlighted that polycystic kidney disease was one of the etiologies of the false-positive findings in the radioiodine scintigraphy. With the knowledge of this paper, some unnecessary CT scan may be omitted and some excessive radiation may be avoided.

References

1. Jiang X, Zeng H, Gong J, et al. Unusual uptake of radiodine in a retroperitoneal bronchogenic cyst in a patient with thyroid carcinoma. Clin Nucl Med 2015;40:435–6.
2. Francoise BD, James CR, Monica CS, et al. False-positive iodine-131 whole-body scans due to cholecystitis and sebaceous cyst. J Nucl Med 1996;37:1690–3.
3. Serafini A, Makianakis G, Georgiou M, et al. Breast cyst simulating metastases on iodine-131 imaging in thyroid carcinoma. J Nucl Med 1998;39:1910–2.
4. Mitchell G, Pratt BE, Vini L, et al. False positive 131I whole body scans in thyroid cancer. Br J Radiol 2000;73:627–35.
5. Pina JS, Meyer CA, Billingsley JL, et al. Inflammatory diseases of the lung causing false-positive 131I iodine whole body scans in the evaluation of papillary thyroid carcinoma. CHEST 1996;110:565–7.
6. Ceylan Gunay E, Erdogan A. Medialastinal radioiodine uptake due to hiatal hernia: a false-positive reason in 131I scan. Rev Esp Med Nucl 2010;29:95.
7. Carlisle MR, Lu C, McDougall IR. The interpretation of 131I scans in the evaluation of thyroid cancer, with an emphasis on false positive findings. Nucl Med Commun 2003;24:715–35.
8. Shen G, Qi Z, Huang R, et al. False-positive uptake of radioiodine in renal hamartoma in a patient with differentiated thyroid cancer. Clin Nucl Med 2017;42:709–10.
9. Heufelder AE, Morgenthaler N, Schipper ML, et al. Sodium iodide symporter-based strategies for diagnosis and treatment of thyroidal and nonthyroidal malignancies. Thyroid 2001;11:839–47.
10. Gonçalves AP, Jorge CS, Resende JP, et al. Benign hepatic cyst mimicking thyroid carcinoma metastasis. Arq Bras Endocrinol Metabol 2009;53:777–82.
11. Okuyama C, Ushijima Y, Kikakawa M, et al. False-positive I-131 accumulation in a liver cyst in a patient with thyroid carcinoma. Clin Nucl Med 2001;26:198–201.
12. Brachman M, Rothman B, Rammanna L, et al. False-positive iodine-131 body scan caused by a large renal cyst. Clin Nucl Med 1998;13:416–8.
13. Wen C, Iuanow E, Oates E, et al. Post therapy iodine-131 localisation in unsuspected large renal cyst: possible mechanisms. J Nucl Med 1998;39:2158–60.
14. Spitzweg C, Dutton CM, Castro MR, et al. Expression of the sodium iodide symporter in the human kidney. Kidney Int 2001;59:1013–23.
15. Chung J, Ahn BC, Lee SW, et al. High and low radioiodine doses to indicate a simple renal cyst. Hell J Nucl Med 2012;15:258–9.