

# Incidentally polycystic kidney disease identified by SPECT/CT with post-therapy radioiodine scintigraphy in a patient with differentiated thyroid carcinoma

## A case report

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### 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 <sup>131</sup>I activity was corresponded to multiple irregular cystic low densities in the both kidneys on the low-dose computed tomography images, so the diagnosis of polycystic kidney disease was confirmed.

**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<sup>+</sup>/I<sup>-</sup> 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.<sup>[1-8]</sup> 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.

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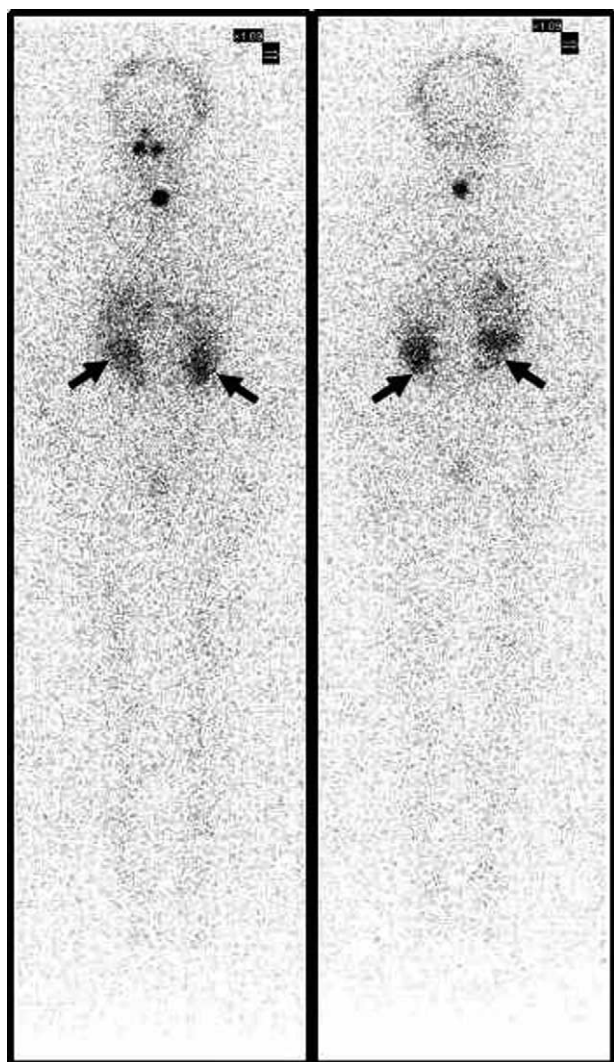
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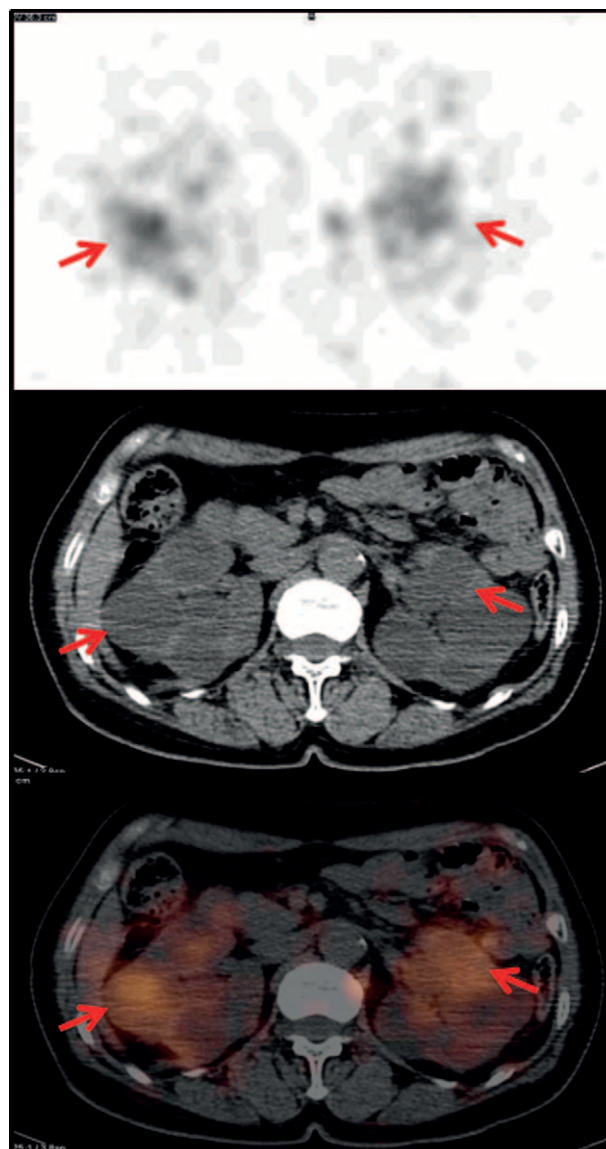
## 2. Case presentation

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 thyroid-stimulating hormone level (89 μIU/mL, normal range: 0.3–5.0 μIU/mL), low level of serum thyroglobulin (2.4 ng/mL, normal range: 11.45–25.47 ng/mL) in addition to normal levels of renal function including the serum creatinine and serum urea. A detailed history taking also revealed no evidence of kidney disease. A total of 100 mCi (3.7 GBq) <sup>131</sup>I was administered with about 10oz water.

Iodine-131 whole-body imaging on the 7th day of therapeutic activity (Fig. 1) demonstrated intense radioiodine 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



**Figure 1.** The post-therapy radioiodine scintigraphy images demonstrated intense radioiodine 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.

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 computed tomography (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.

### 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  $\text{Na}^+/\text{I}^-$  symporter (NIS) and the excretion of the radioiodine. 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.<sup>[9]</sup> So it is important to distinguish the nonpositive uptake when we interpret the radioiodine 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.<sup>[10]</sup> One possible reason is that there is a communication between the renal cyst and the collecting systems of kidney.<sup>[11–13]</sup> Another is due to NIS, which promotes iodine transport in the thyroid, has recently been found in renal tissue.<sup>[14,15]</sup>

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,<sup>[10]</sup> 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.

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