



False-positive radioiodine whole-body scan due to a renal cyst

Fałszywie dodani wynik scyntygrafii całego ciała z użyciem radiojodu spowodowany obecnością torbieli nerkowej

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Abstract

Patients affected by differentiated thyroid cancer are treated surgically and by ablative radioiodine therapy. A post-therapy whole-body scan allows detection of thyroid remnants or local and distant metastases, although false-positive findings may be observed. We report a case of a 75-year-old woman with follicular thyroid cancer, who underwent ablative radioiodine treatment. On post-therapy whole-body scan, abnormal uptake in the left upper abdomen was found, although stimulated thyroglobulin level was not suggestive for distant metastases of differentiated thyroid carcinoma. Additional SPECT/CT acquisition revealed focal ^{131}I uptake located at the posterolateral wall of the left kidney corresponding to a round lesion 47 mm in maximal diameter. In order to verify this finding abdominal ultrasound and abdominal contrast-enhanced CT were performed, confirming multiple renal cysts in the left kidney; the largest one was the site of abnormal radioiodine accumulation. Despite the high incidence of renal cysts, especially in the elderly, radioiodine uptake in renal cysts is extremely rare. Different hypotheses on the mechanism of radioiodine uptake in the cyst were proposed, among them active secretion by sodium-iodide symporter or other transporting proteins. We conclude that abnormal radioiodine uptake in renal cysts can be an exceptional finding mimicking a metastasis. (*Endokrynol Pol* 2018; 69 (6): 736–739)

Key words: follicular thyroid cancer; renal cyst; radioiodine; post-therapy whole-body scan

Streszczenie

U chorych ze zróżnicowanymi rakami tarczycy stosuje się leczenie chirurgiczne oraz ablację tarczycy radiojodem. Scyntygrafia kontrolna po leczeniu umożliwia wykrycie pozostałości tarczycy oraz przerzutów miejscowych lub odległych, chociaż obserwuje się czasami wyniki fałszywie dodatnie. W niniejszej pracy przedstawiono przypadek 75-letniej kobiety z rakiem pęcherzykowym tarczycy poddanej ablacji radiojodem. W scyntygrafii całego ciała wykonanej po leczeniu stwierdzono nieprawidłowy wychwyty w lewej górnej części jamy brzusznej, chociaż stężenie tyreoglobuliny po stymulacji TSH nie wskazywało na obecność przerzutów odległych zróżnicowanego raka tarczycy. Dodatkowe badanie SPECT/CT uwidocznilo ogniskowy wychwyty ^{131}I zlokalizowany w tylnobocznej ścianie nerki lewej odpowiadający okrągłej zmianie o maksymalnej średnicy 47 mm. W celu zweryfikowania tego wyniku wykonano USG jamy brzusznej oraz badanie tomograficzne jamy brzusznej z kontrastem. Badania te potwierdziły obecność mnogich torbieli w lewej nerce, z których największa odpowiadała miejscu patologicznej akumulacji radiojodu. Mimo że torbiele nerkowe występują często, zwłaszcza u osób w podeszłym wieku, wychwyty radiojodu w takich torbielach obserwuje się niezwykle rzadko. Przedstawiano różne hipotezy wyjaśniające mechanizm wychwyty radiojodu w torbielach nerkowych, w tym aktywne wydzielanie przez symporter sodowo-jodowy lub inne białka transportowe. Autorzy doszli do wniosku, że patologiczny wychwyty radiojodu w torbieli nerkowej może być wyjątkowym zjawiskiem imitującym zmianę przerzutową. (*Endokrynol Pol* 2018; 69 (6): 736–739)

Słowa kluczowe: rak pęcherzykowy tarczycy; torbiel nerkowa; radiojod; poterapeutyczna scyntygrafia całego ciała

Introduction

Patients diagnosed with differentiated thyroid cancer (DTC), both papillary and follicular type, are typically treated by surgical removal of the primary tumour (thyroidectomy or lobectomy) followed by radioiodine therapy (RIT) as an adjuvant therapy (excluding low-risk patients) [1]. Post-therapy ^{131}I whole body scan (WBS) is performed a few days after RIT to detect thyroid remnants and possible regional or distant metastases. WBS is considered accurate and highly sensitive; however, it should be interpreted cautiously because false-positive results and artefacts of different origin may occur.

We present a case of a radioiodine-treated DTC patient. Post-therapy WBS showed abnormal radioiodine uptake in the left abdomen, corresponding to the renal location, which turned out to be a renal cyst. This type of artefact is rarely reported, and the mechanism of renal cysts radioiodine uptake is still uncertain.

Case report

A 75-year-old female was admitted to the Department of Endocrinology for assessment and ablative radioiodine treatment in the course of DTC. Total thyroidectomy was performed three months before, and minimally

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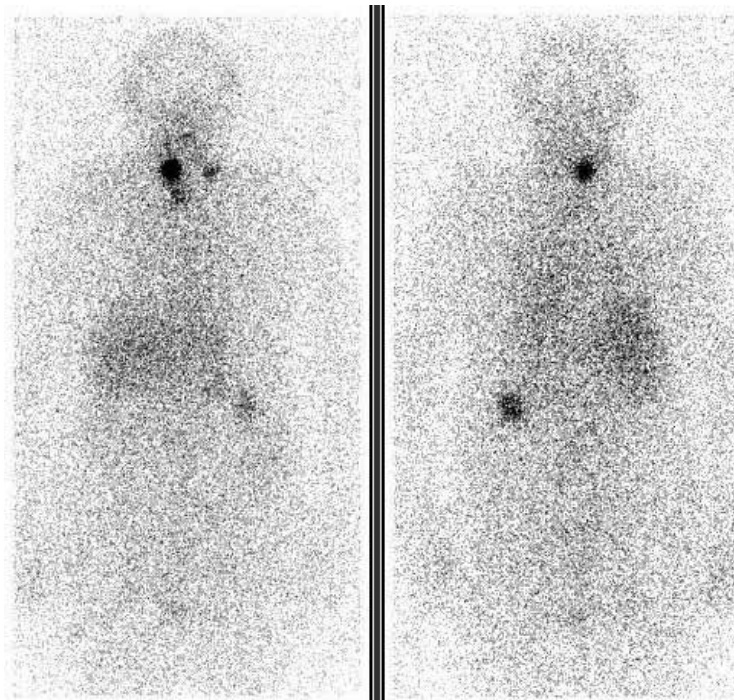


Figure 1. Post-therapeutic WBS showing uptake in thyroid bed and left upper abdomen, better seen in posterior view

Rycina 1. Poterapeutyczna scyntygrafia całego ciała pokazująca wychwyty w łożu tarczycy i lewej górnej części jamy brzusznej, lepiej widoczny w projekcji bocznej

invasive follicular thyroid cancer in the right thyroid lobe was found on histopathology (maximal diameter of the tumour 3.5 cm) — stage pT3N0Mx.

At the time of admission, four weeks after levothyroxine withdrawal, stimulated thyroglobulin (Tg) was 5.80 ng/ml, while anti-Tg was 27 IU/ml (normal range: 10–115) and TSH was 35.03 μ U/ml (normal range: 0.27–4.2). Neck ultrasonography showed an absence of thyroid remnants or metastatic lymph nodes. An 131 I thyroid scan was performed before RIT, showing only minor focal remnants in the thyroid bed. The patient had no history of any significant comorbidities. Standard laboratory tests did not reveal any abnormalities (among them, serum creatinine and urea were found to be normal).

The patient underwent RIT with the activity of 120 mCi (4.4 GBq). WBS was performed 10 days after RIT, using an Infinia Hawkeye 4 gamma-camera (GE Healthcare) (Fig. 1). WBS showed some thyroid remnants within the thyroid bed, physiologic uptake areas, and abnormal radioiodine uptake in the left upper abdominal area, more pronounced at the posterior view. In order to verify the finding, single photon emission computed tomography/computed tomography (SPECT/CT) of the abdomen was obtained using the same gamma-camera (Fig. 2). The study confirmed abnormal 131 I uptake located at the posterolateral wall of the left kidney. The focus corresponded to a round

lesion with dimensions 39 \times 35 \times 47 mm adjacent to the renal capsule. As the risk of metastasis to the kidney or perirenal tissue could not be excluded, the patient underwent abdominal ultrasound. Ultrasound imaging showed three anechoic structures of 44 mm, 14 mm, and 10 mm in maximum diameter localised in the left kidney, which were described as simple renal cysts, without any features of malignancy.

Because renal cysts, which are relatively common in the general population, usually do not present with radioiodine uptake on WBS, CT of the abdomen was planned. Because of recent RIT, contrast-enhanced CT was performed four months after RIT. The study confirmed multiple simple cysts of the left kidney, with the largest one having a maximal diameter of 47 mm (Fig. 3). There were neither malignancy features nor other abnormalities found within the kidneys.

After RIT the patient was referred to outpatient endocrine care, and reassessment on levothyroxine withdrawal is planned after one year.

Discussion

Renal cysts are structures of the renal parenchyma filled with liquid or semisolid fluid enclosed by a smooth wall built of epithelial cells [2]. They can be classified into simple and complex. The incidence of simple renal cysts differs depending on age, population studied, and

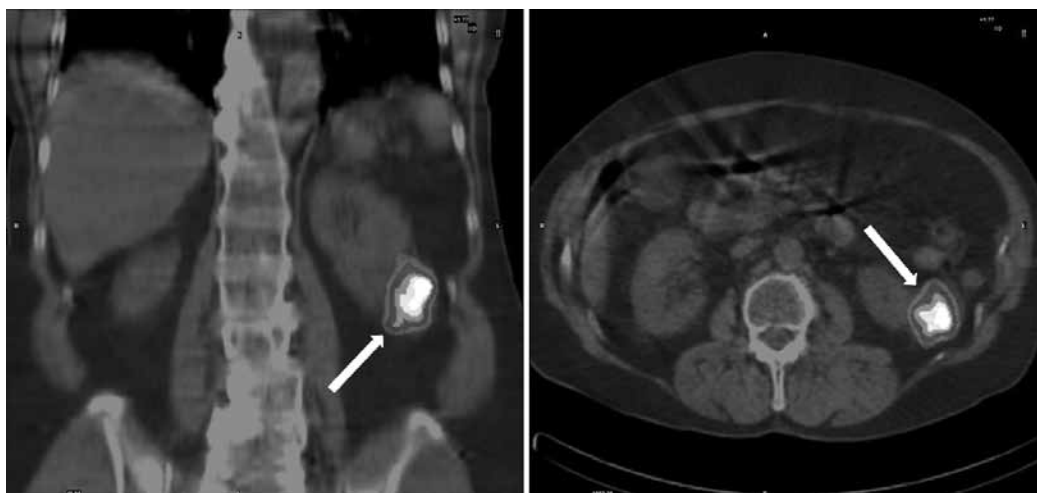


Figure 2. SPECT/CT images that revealed focal uptake at the posterolateral part of the left kidney with size $39 \times 35 \times 47$ mm

Rycina 2. Obrazy SPECT/CT uwiidocznily ognisko wychwytu w boczno-tylnej częsci lewej nerki o wymiarach $39 \times 35 \times 47$ mm

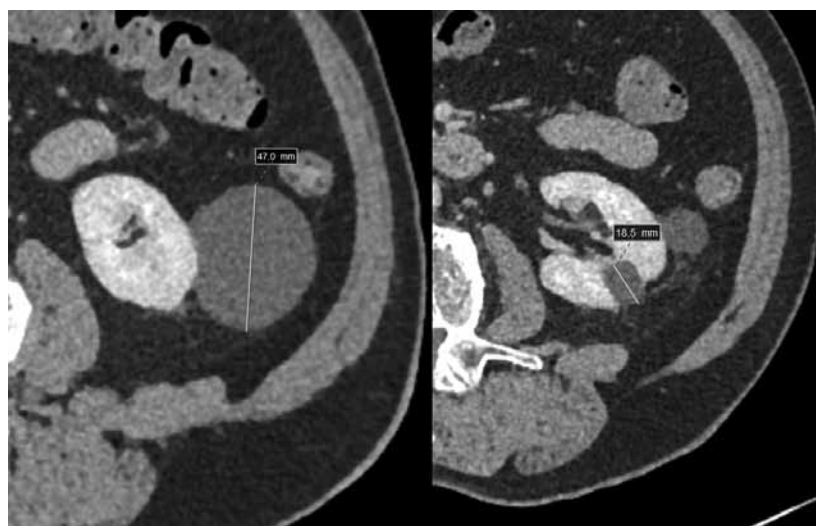


Figure 3. Contrast-enhanced CT images showing multiple cysts of the left kidney

Rycina 3. Obrazy TK ze środkiem kontrastowym pokazujące liczne torbiele w lewej nerce

imaging techniques used, generally increasing with age [2]. They can be found in up to 60.6% of people over 80 years of age [3]. Male preponderance is observed with male-to-female ratios from 1.4 to 2.8 [3]. Simple renal cysts are acquired, non-hereditary lesions, and usually no treatment is needed, unlike polycystic kidney disease. Because simple renal cysts are generally asymptomatic, most of them are found incidentally during assessment for different reasons. Imaging techniques used in renal cysts assessment are abdomen ultrasound or CT, and rarely MRI.

Campenni et al. reviewed the literature on this topic, finding nine cases of ^{131}I uptake in renal cysts, and they reported another one [4]. Recently Yan-Xia et al. described abnormal ^{131}I uptake in a patient with

polycystic kidney disease [5]. Kidneys are the main organs of iodine excretion. Iodine is eliminated as an inorganic anion (mostly within two days after oral administration). However, a precise explanation of the mechanism of radioiodine uptake by renal cysts is lacking. Different hypotheses exist, one of them is a preserved communication between the cyst and collecting ducts, although it seems that typically renal cysts are detached from the tubule at an early stage of their development [6]. Another option is iodine passive diffusion from surrounding lymphatic or blood vessels. Finally, some authors advocate the third option, that iodine is actively secreted to the renal cyst lumen via transmembrane channels or co-transporting proteins [4].

These acquired cystic lesions are generally believed to arise from nephrons tubular diverticula. Moreover, the fact is that epithelial cells lining renal cysts resemble those of renal tubules [5]. That is why renal cyst epithelium is expected to exhibit secretory activity that probably varies depending on its origin (from different tubular segments). Different proteins involved in iodine transportation, known best due to their intrathyroidal function, have been found to be expressed in kidneys. One of them is Na⁺/I-symporter (NIS) — a transmembrane protein that mediates the active transport of iodide into the thyrocytes. Functional NIS protein was detected in renal tubular cells in some studies, although with variable expression in different segments of the kidney [7, 8]. However, because the protein was shown to be localised at the apical surface of tubular cells, NIS would be responsible for iodide reabsorption from renal tubule lumen [9], so similarly in renal cysts it would lead to intraepithelial influx. Other transporting proteins known primarily from thyroid gland studies (where they are thought to be involved in iodide efflux to the follicular lumen), which transpired to be expressed in kidneys are pendrin [10], CFTR, and CIC-5. Nevertheless, their precise role in iodine balance maintenance is still discussed [11].

Post RIT uptake in the abdomen at planar scintigraphy, similar to this presented herein, may be for different reasons. It could be an effect of physiological gastrointestinal residual activity (e.g. stomach, colon), a result of artifacts (among them renal cysts), etc., but DTC metastases must also be taken into account. Although DTC metastases to kidneys are very rare, some cases were indeed reported. On autopsy, 2.5 to 2.7% of all metastases to the kidney originated from thyroid carcinoma [12]. Some of them may be seen on WBS as a result of NIS expression [13]. That is why unilateral post-therapeutic uptake in kidneys should be assessed by an anatomical study, preferentially CT scan.

Literature provides numerous examples of focal ¹³¹I uptake that was first misdiagnosed as DTC metastasis. Similarly to renal cysts, there are descriptions of other cysts, e.g. liver, nabothian, sebaceous, or ovarian cysts, mimicking DTC metastases [14]. False-positive uptake on post-RIT scans may also result from non-thyroid neoplasms (both benign and malignant), retention of ¹³¹I-containing secretions, or just contamination of the skin or clothing [14]. In most cases, a readily available technique of SPECT/CT is able to differentiate these findings. Conversely, in the case of non-iodine avid metastases, false-negative results are observed. In these rare situations, different techniques such as ¹⁸F-FDG

PET/CT or somatostatin receptor scintigraphy may be helpful [15].

Conclusions

Post-RIT WBS is a reliable method for the detection of DTC remnants, recurrence, or metastases, although different reasons for false-positive results must be taken into account. Some of them are relatively common, while the others (such as simple renal cysts) are very rare, thus making differential diagnosis challenging.

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