Unusual Adrenal Gland Metastasis in a Patient with Follicular Carcinoma of the Thyroid Evidenced by ^{18}F -FDG PET/CT and Confirmed by Biopsy

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Follicular thyroid carcinoma (FTC) is a relatively rare form of differentiated thyroid carcinoma, but it is important to recognise that FTC may be very aggressive, may not respond to radioiodine treatment and may cause life-threatening complications [1, 2].

The use of ^{18}F -fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F -FDG PET/CT) has rapidly grown in the latest years in patients with differentiated thyroid carcinoma (DTC) with a negative radio-iodine scan despite clearly elevated levels of thyroglobulin [3]. The biological pattern of DTC, which loses its thyroid-specific iodide-trapping properties and becomes FDG-avid, reflects enhanced aggressiveness and is related to a worse prognosis than FDG-negative tumours [4]. In addition, there is evidence that several factors associated with FDG positivity (tumour size, lymph node metastasis, and glucose transporter expression and differentiation) are related to a poor prognosis in patients with FTC [5].

A 78-year-old woman with a history of FTC came under our observation to undergo an ^{18}F -FDG PET/CT scan for the first time for restaging purpose. Total thyroidectomy had been performed 19 years previously and radio-iodine treatment reached a total activity level of 1.8 Ci (66.6 GBq) over 10 years. The aggressive treatment did not prevent the development of a widespread metastatic disease involving lymph

nodes and bones. The most painful bone metastases were treated with external beam radiation therapy, with effective relief of the symptoms. A suppressive therapy with L-thyroxine was started. Thyroglobulin levels were checked yearly, and were relatively high but under control (maximum value, 32.3 ng/ml). However, the thyroglobulin levels suddenly rose up to 117.5 ng/ml 6 months previously. A ^{131}I whole-body scan was requested but the result was negative (Fig. 1). Therefore the patient was referred to our department to undergo an ^{18}F -FDG-PET/CT scan.

Sixty minutes following intravenous injection of 138 MBq of ^{18}F -FDG, low-dose CT and PET images from the skull base to mid-thigh were acquired using a hybrid Biograph mCT TOF PET/CT scanner (Siemens Medical Solutions, Erlangen, Germany). Images revealed FDG-avid lesions in the sternum (SUVmax 3.5), L1 (SUVmax 8) and in the lower lobe of the right lung (SUVmax 6.3) (Fig. 2a). Moreover, there was evidence of another pathological uptake (SUVmax 7.3) in the left adrenal gland (Fig. 2b-d). The adrenal lesion was surgically removed and pathological examination revealed metastasis from the FTC (Fig. 3).

The patient was then referred to the clinical oncologist to evaluate possible further therapies.

The adrenal gland is a very uncommon site of metastatic spread from thyroid carcinoma. Only a few cases have been reported in the literature, describing adrenal metastases in patients affected by papillary thyroid carcinoma [6–8] or anaplastic thyroid carcinoma [9].

Although a case of iodine-avid adrenal lesion has been described previously [10], to our knowledge, this is the first case report of an adrenal gland metastasis imaged by ^{18}F -FDG PET/CT in a patient affected by FTC with high thyroglobulin levels and negative ^{131}I whole-body scan.

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Fig. 1 ^{131}I whole-body scan images

Fig. 3 Haematoxylin and eosin stained section of the surgically removed adrenal lesion

Fig. 2 **a** Maximum intensity projection (MIP) image; **b** transaxial PET image; **c** transaxial CT image; **d** transaxial fused PET/CT image. Arrows FDG-avid lesions

Disclosure All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Conflict of interest Federico Caobelli, Natale Quartuccio, Claudio Pizzocaro, Giordano Savelli and Ugo Paolo Guerra declare that they have no conflict of interest.

References

1. Baloch Z, Li Volsi VA, Tondon R. Aggressive variants of follicular cell derived thyroid carcinoma; the so called 'real thyroid carcinomas'. *J Clin Pathol*. 2013;66:733–43.
2. French JD. Revisiting immune-based therapies for aggressive follicular cell-derived thyroid cancers. *Thyroid*. 2013;23:529–42.
3. Vural GU, Akkas BE, Ercakmak N, et al. Prognostic significance of FDG PET/CT on the follow-up of patients of differentiated thyroid carcinoma with negative ¹³¹I whole-body scan and elevated thyroglobulin levels correlation with clinical and histopathologic characteristics and long-term follow-up data. *Clin Nucl Med*. 2012;37:953–9.
4. Robbins RJ, Wan Q, Grewal RK, Reibke R, Gonen M, Strauss HW, et al. Real-time prognosis for metastatic thyroid carcinoma based on 2-[¹⁸F]fluoro-2-deoxy-D-glucose-positron emission tomography scanning. *J Clin Endocrinol Metab*. 2006;91:498–505.
5. Pak K, Kim SJ, Kim IJ, et al. The role of 18 F-fluorodeoxyglucose positron emission tomography in differentiated thyroid cancer before surgery. *Endocr Relat Cancer*. 2013;20:R203–13.
6. Batawil N. Papillary thyroid cancer with bilateral adrenal metastases. *Thyroid*. 2013;23:1651–4.
7. Malhotra G, Upadhye TS, Sridhar E, et al. Unusual case of adrenal and renal metastases from papillary carcinoma of thyroid. *Clin Nucl Med*. 2010;35:731–6.
8. Copland JA, Marlow LA, Williams SF, et al. Molecular diagnosis of a BRAF papillary thyroid carcinoma with multiple chromosome abnormalities and rare adrenal and hypothalamic metastases. *Thyroid*. 2006;16:1293–302.
9. Iagaru A, McDougall IR. F-18 FDG PET/CT demonstration of an adrenal metastasis in a patient with anaplastic thyroid cancer. *Clin Nucl Med*. 2007;32:13–5.
10. Xue YL, Song HJ, Qiu ZL, et al. An unusual ¹³¹I-avid adrenal metastasis from follicular thyroid carcinoma identified by ¹³¹I-SPECT/CT. *Clin Nucl Med*. 2012;37:e229–30.