Solitary adrenal gland metastasis of a follicular thyroid carcinoma presenting with hyperthyroidism

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Follicular thyroid carcinoma typically manifests under euthyroid conditions, and diagnostic scintigraphy usually identifies a cold nodule. Sometimes, such tumors can appear in the context of hyperthyroidism, which can be caused by a toxic multinodular goitre, a toxic adenoma, or even carcinoma. We report a case of follicular thyroid carcinoma discovered after surgical treatment of a toxic multinodular goiter, in which solitary adrenal gland metastasis was detected five years later. A $^{131}$I whole body scan is the diagnostic method of choice for functioning thyroid metastasis.

Key words: Adrenal metastasis, follicular thyroid cancer, hyper-thyroidism.

Métastase surrénale solitaire d’un cancer folliculaire de la thyroïde avec hyper-thyroidie

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Le cancer folliculaire de la thyroïde se manifeste typiquement en euthyroidie, et la scintigraphie préopératoire identifie habituellement un nodule froid. Parfois, des tumeurs peuvent apparaitre dans le contexte de l’hyperthyroidie et peuvent être provoquées par un goitre multinodulaire toxique ou un adenome toxique et par le cancer lui-même. Nous rapportons un cas de carcinome folliculaire de la thyroïde découvert après le traitement chirurgical d’un goitre multinodulaire toxique et dans lequel une métastase solitaire de la glande surrénale a été détectée cinq ans après le diagnostic. La scintigraphie corporelle totale à $^{131}$I est la méthode diagnostique de choix pour les métastases thyroïdiennes fonctionnelles.

Mots-clés : Métastase surrénale, cancer folliculaire de la thyroïde, hyper-thyroidie.

CASE REPORT

Follicular thyroid carcinoma is the second most common thyroid malignancy, accounting for 5-15 % of all such tumors [8]. $^{99m}$Tc scintigraphy generally reveals a single, cold thyroid nodule. Thyroid cancer manifesting as a hot nodule is much less frequent, with a prevalence of 0-4 % in adults [3]. The coexistence of a thyroid neoplasm and hyperthyroidism secondary to Graves’ disease or toxic multinodular goitre is infrequent, and has been found to vary among regions depending on the prevalence of iodine deficiency.

We report an unusual case of follicular thyroid carcinoma initially presenting as toxic multinodular goitre (Plummer’s disease) by scintigraphy, followed 5 years after diagnosis by the detection of a single functional adrenal gland metastasis.

A 59-years-old male presented a large goitre for the past six years, with progressive growth and typical manifestations of hyperthyroidism for the last two years. Thyroid functional studies confirmed the diagnosis : serum thyroxine (T4) level was 19.3 µg/dL, triiodothyronine (T3) 422.5 ng/dL, free T4 (fT4) 5.4 ng/dL and thyroid stimulating hormone (TSH) 0.01 µU/mL. The serum thyroglobulin (Tg) concentration was also...
elevated (127.9 ng/mL). Anti-thyroid stimulating hormone receptor and microsomal thyroid antibodies were all negative. Cervical X-rays revealed left tracheal displacement with enlargement of the right upper mediastinum suggesting the presence of endo-thoracic goiter. Thyroid $^{99m}$Tc scintigraphy showed a multinodular goitre pattern at the expense of the right lobe, with intense uptake in several nodules and silence of the left thyroid lobe (*fig. 1*). Unfortunately, no ultrasound study was performed at this time.

The hyperthyroidism proved refractory to initial treatment in the form of progressively increasing antithyroid doses, and to subsequent $^{131}$I therapy - administering a total of 133.5 mCi in 5 doses over a two and a half year period. Accordingly, a right hemithyroidectomy was performed to remove the hyperfunctional lobe, three years after the clinical diagnosis. The histopathological study of the surgical specimen revealed an irregular parenchyma with hyperplastic areas, foci of necrosis and small cysts – all indicating multinodular goitre – and moreover, typical follicular carcinoma (6 cm in longest diameter), with manifest capsular and vascular invasion. Immunohistochemistry of the carcinoma was not performed. A completion thyroidectomy was performed 30 days later, adding a bilateral lymph node dissection. Histologically, the left lobe showed normal thyroid cytoarchitectural features. None of seven lymph nodes obtained were involved.

Seven weeks after the second surgical intervention, $^{131}$I scintigraphy demonstrated minimal uptake in the thyroid bed. It was therefore decided to not administer an ablative radioiodine dose. The follow-up included TSH suppressive therapy with levothyroxine and periodic whole-body imaging. The subsequent course was satisfactory, with T4 and TSH serum levels within normal range. Thyroglobulin concentrations decreased to normal following the total thyroidectomy (< 5 ng/mL). However, five years after the diagnosis of the carcinoma, the Tg levels increased to 329.6 ng/mL. The thyroxine concentration stayed within the normal range, and TSH remained suppressed. A $^{131}$I whole body scan was thus performed to discard possible local or distant recurrence of the disease. Activity was found to be limited to a region of intense uptake in the upper right abdominal quadrant (*fig. 2*); no activity was detected in the thyroid bed. Ultrasound and computed tomography detected a solid right adrenal mass measuring 4 cm in greater diameter. A hormonal study was performed to rule out adrenal tumors such as pheochromocytoma and aldosteronoma.

The surgical decision was taken and the right adrenal gland was removed through open surgery, revealing an encapsulated $3 \times 4$ cm metastasis of thyroid origin. Histology revealed a solid tumor composed of small, closely

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**Figure 1:** $^{99m}$Tc Thyroid scan presenting an irregular pattern of tracer uptake in the right lobe. There are both functioning (hot) and non-functioning (cold) nodules, a typical appearance of multinodular goitre. The left lobe is suppressed.

**Figure 1 :** La scintigraphie préopératoire à le $^{99m}$TC présente une distribution irrégulière du lobe droit. Il y a des nodules fonctionnants (chauds) et non-fonctionnants (froids), une apparence typique du goître multinodulaire. Le lobule gauche est absent.

**Figure 2:** $^{131}$I whole body scan showing activity in the right superior abdominal quadrant, the theoretical localization of the right adrenal gland.

**Figure 2 :** La scintigraphie corporelle totale à le $^{131}$I montre une activité du quadrant abdominal supérieur droit, la localisation théorique de la glande surrenale droite.
packed follicles. The immunohistochemical study in turn revealed cells consistently positive for thyroglobulin. The subsequent course was uneventful, with normalization of the thyroglobulin concentrations after 7 months.

DISCUSSION

$^{99m}$Tc scintigraphy is important in the evaluation of hyperthyroidism, in order to rule out nodular disease fundamentally toxic adenoma or toxic multinodular goiter. Thyroid follicular carcinoma generally appears on scintigraphy scans as a cold nodule, with only rare presentations in the form of a hot nodule.

The prevalence of thyroid cancer in hot nodules is estimated at between 4 and 11 %; both papillary and follicular tumors may be observed, though papillary lesions tend to be microcarcinomas measuring 1 cm in size or less [4]. Thyroid cancers presenting in this way are often chance discoveries in the absence of suggestive clinical manifestations (e.g., cervical adenopathies, signs of recent nodule growth, local pain or tenderness, recurrent nerve paralysis or a history of radiotherapy or radiation exposure).

The gammagraphic pattern observed in the present study corresponds to multinodular goitre confined to the right lobe, the left lobe exhibiting normal pattern. Intense uptake was observed in several nodules, though at least two nodules showed no marker uptake in this same lobe (cold nodules). In our opinion, two possibilities may be proposed to account for these observations: superpositioning of some hot nodules before a cold nodule representing the carcinoma; or a carcinoma with cold and hot areas. We are in favor of the first possibility, and think that the follicular carcinoma developed in the context of a hyperfunctioning multinodular goiter.

The association between hyperthyroidism and thyroid carcinoma is observed in 0,76–21 % of cases, depending on the author, and is related to the possible presence of iodine deficiency in the geographical setting studied [9]. Although the association is infrequent, toxic multinodular goitre seems to be more commonly related to carcinoma than either toxic adenoma or Graves’ disease.

The continuous growth of the goiter and the failure of the treatment with $^{131}$I are the reasons for surgery in this case. Lacking during follow-up before the thyroidectomy was a thyroid ultrasonographic study, and particularly a percutaneous fine needle aspiration cytology of the solid and/or the largest nodules. The adoption of such measures could have contributed to establish the diagnosis of carcinoma or at least the suspicion of malignancy, thereby ensuring earlier surgery.

The differential diagnosis of an adrenal tumoration discovered by chance in an adult comprises cortical adenoma, adrenocortical carcinoma, pheochromocytoma, cysts, ganglioneuroma, organized fibrosis or hemorrhage, myelolipoma, and adenolipoma [10]. However, metastases are the most frequent malignancies observed in the adrenal gland in patients with a history of malignant disease. The tumors that most frequently produce adrenal metastasis are melanoma, hypernephroma and cancer of the lungs, breast and stomach. A thyroid origin is infrequent. Although, however, the most common sites where follicular thyroid carcinoma metastasizes are the lung and bone, metastases may arise in other rare sites such as adrenal gland [5-7]. Fewer than 1/2000 thyroid tumors initially manifest with an adrenal mass as first metastatic site [7].

Despite the fact that whole body scan showed $^{131}$I uptake in the right adrenal gland – suggesting its thyroid origin – an evaluation of hormone activity was decided to rule out dangerous adrenal tumors. In the present case, serum potassium and aldosterone levels were determined to eliminate aldosteronoma, while 24-hours urine concentrations of vanillylmandelic acid, metanephrine and catecholamines were assayed to rule out pheochromocytoma.

With the antecedent of a malignant lesion, and after ruling out pheochromocytoma, percutaneous fine needle aspiration cytology under computed tomography guidance is the diagnostic method of choice [1, 2]. This technique was not employed in our case, however, since the $^{131}$I uptake observed in the adrenal lesion by the whole body scan was suggestive of thyroid metastasis.

Open surgery to remove such metastases is the recommended management approach. In this sense, laparoscopic surgery does not seem indicated, due to the risk of peritoneal neoplastic dissemination [10].

Though follicular thyroid carcinoma usually metastasizes to lung and bone, other rare sites can also be affected. The detection of activity with $^{131}$I whole body scan suggests metastases in these rare localizations.

REFERENCES


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