In-Pentetreotide uptake in a follicular adenoma of the thyroid gland: a pitfall for In-Pentetreotide scintigraphy

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Abstract.—A patient with suspicion of a neuroendocrine tumor of the pancreas underwent a somatostatin receptor scintigraphy using 111m-Pentetreotide. 111In-pentetreotide scintigraphy showed discrete uptake of the radiotracer in the head of the pancreas and focal uptake in the right upper thyroid lobe. Tracer uptake in the 24h planar image was higher compared to the 4h image, and decreased after 48 hours. Normal thyroid tissue and thyroid disorders, such as cancers, Hashimoto’s thyroiditis, and adenomas often show increased uptake of 111In-pentetreotide resulting in a possible false positive interpretation in patients with neuroendocrine tumor. Adding a 48h planar image might contribute to the differential diagnosis between benign or malignant lesions, as in the present case where the uptake decreased in an adenoma after 48 hours.

KEY WORDS: 111In-Pentetreotide, thyroid adenoma.

INTRODUCTION

111In-pentetreotide is used for the evaluation and therapy planning of somatostatin receptor positive neuroendocrine tumors and their metastases. In thyroid benign disorders, such as Grave’s disease and ophthalmopathy, Hashimoto and De Quervain thyroiditis, nodular goiter, toxic adenoma as well as malignant tumors, such as papillary, follicular, anaplastic, and medullary thyroid carcinoma, and non-functional metastases of differentiated thyroid carcinoma uptake of 111In-pentetreotide was observed. Recently, 111In-pentetreotide accumulation in a thyroid gland mimicking a metastasis of a previously operated, renal-cell carcinoma in a patient with multiple endocrinological neoplasms was published. 111In-pentetreotide uptake was observed in normal functioning colloid thyroid nodules, multinodular, nodular, colloidal nodule with chronic thyroiditis, cellular colloid nodule, and in endemic goiter. Accumulation of 111In-pentetreotide in various tissues and organs such as pituitary gland, spleen, liver, kidney and urinary bladder, in colon, sarcoidosis, tuberculosis, ventral hernia, parapelvic renal cyst, granuloma etc. was also reported.

CASE REPORT

A 54-year-old men with the suspicion of a neuroendocrine tumor of the pancreas was referred to the Department of Nuclear Medicine. The patient underwent a somatostatin receptor scintigraphy after injection of 200MBq of 111m-Pentetreotide. Four and 24 hour post injection thoracic and abdominal planar images and a Single Photon Emission Computed Tomography (SPECT) study were acquired. 111In-pentetreotide scintigraphy showed discrete uptake of the radiotracer in the head of the pancreas (fig. 1) and focal uptake in...
In-pentetreotide uptake in the 24h planar image was higher compared to the 4h image, and decreased after 48 hours. Thyroid ultrasonography revealed a 27 × 14 × 18 mm sized iso-echoic homogenous thyroid lesion of the right thyroid lobe with good vascularization in the Duplex scan, and a second, echopenic nodule with a diameter of 5 mm located below this lesion (fig. 3). On 123I scintigraphy (fig. 4), the lesion was a cold lesion suggesting a possible malignant tumor suggestive for a metastasis of the neuroendocrine tumor. The patient's thyroid hormone tests were normal. The tumor was removed surgically. The histopathological diagnosis was a thyroglobulin-positive follicular thyroid adenoma. The lesion was negative for serotonin or chromogranin A.

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Fig. 1.—24 h. abdominal Single Photon Emission Computed Tomography revealed a positive 111In-pentetreotide uptake in the region of pancreas-head (arrow).

Fig. 2.—24 h. (A) and 48 h. (B) planar 111In-Pentetreotide static images show the tracer accumulation in follicular adenoma in the upper thyroid pole (arrows).

Fig. 3.—Patient's thyroid ultrasonography revealed an upper side located follicular adenoma (arrow) and the second hypo-echoic nodule (arrow head).

Fig. 4.—123I-Pertechnetate thyroid scan shows the cold adenoma located on the upper pole of the right thyroid (arrow head).
DISCUSSION

According to the uptake of octreotide in various thyroid lesions such as C-cell (medullary thyroid) carcinoma, activated lymphocytic infiltration (Hashimoto’s thyroiditis, Grave’s disease)15, it is concluded that the presence of somatostatin receptors in these cells is responsible for octreotide uptake. This is supported by in vitro and in vivo studies on the effect of somatostatin on the thyroid gland. Ahren et al found a blocking effect of somatostatin after systemic administration of thyroid hormones induced by injection of TSH in humans. An inhibiting effect (being more pronounced in neoplastic thyroid tissue) of somatostatin on basal and TSH-stimulated adenylate cyclase activity in normal and neoplastic thyroid tissue was reported by Sipersstein et al15. In experimental studies it was shown that somatostatin inhibits the growth of thyroid cells16, DNA synthesis in thyroid cells17, and the proliferation of thyroid cell lines18. However, Hoehnig et al18 reported that octreotide has a stimulatory effect at low concentrations and an inhibitory effect at high concentrations regarding the growth and invasion of follicular thyroid cell lines. This was not observed in animals.

Recently, high expression of mRNA for the somatostatin receptor subtype 3 (SSTR3) and SSTR5 and weak expression of mRNA for SSTT1 and SSTR2 was reported in normal thyroid tissue19. Although the expression of mRNA of SSTR does not always accurately reflect the level or the presence of the SSTR in thyroid cells, the positive uptake of octreotide in benign and malignant thyroid tissues indicates the presence of SSTRs in thyroid cells. Additionally, it may be possible that octreotide uptake in activated lymphocyte infiltration does contribute to the octreotide uptake in differentiated thyroid carcinoma, autoimmune thyroiditis and Grave’s disease. In Hürthle cell carcinoma, mainly the SSTR2 expression, and in follicular adenoma, papillary and follicular thyroid carcinoma SSTR1, SSTR3, SSTR4 and SSTR5 expression was found14. In normal parafollicular C-cells and medullary thyroid carcinoma, all subtypes of somatostatin receptors were found14. Tisel et al20 reported on the positive uptake of 111In-pentetreotide in six patients with Hürthle cell lesion presenting with a cold thyroid nodule by 99mTc-pertechnetate scintigraphy. In two patients thyroidectomized previously because of Hürthle cell carcinoma, they found positive uptake of 111In-pentetreotide in pulmonary metastases being negative in the I-131 scan.

The somatostatin receptor subtypes SSTR2—which has the highest affinity to octreotide—SSTR3 and SSTR5 are the target receptors for octreotide. Since the follicular thyroid cells express mainly SSTR3, and SSTR5 subtypes, it may be concluded that these two subtypes are responsible for the uptake of 111In-pentetreotide in our case with follicular adenoma. Adding a 48h planar image might contribute to the differential diagnosis of benign or malignant lesion, as in the present adenoma the uptake decreased after 48 hours.

REFERENCES


