Clinical case

F-18 FDG PET detection of a medullary thyroid carcinoma in a patient with metastatic colonic cancer; literature review

R. Cohen a,∗, H. Bihan a, G. des Guetz b, P. Wind c, A. Martin d

a Department of Endocrinology, Diabetology and Metabolic Disease, Avicenne Hospital, Paris XIII University (CRNH), 125, route de Stalingrad, 93009 Bobigny cedex, France
b Department of Oncology, Avicenne Hospital, 9309 Bobigny, France
c Department of Visceral Surgery, Avicenne Hospital, 9309 Bobigny, France
d Department of Pathology, Avicenne Hospital, 9309 Bobigny, France

Available online 10 September 2009

1. Introduction

Medullary thyroid carcinoma (MTC) is an uncommon calcitonin neoplasm. It represents 3 to 8% of all thyroid cancers, but is responsible for up to 14% of all thyroid cancer deaths [1]. Sporadic cases most often occur after the fifth decade of life. Its prognosis is good with a 15-year survival rate of 70% [2]. Positive diagnosis of MTC is established on pathology, but could have been previously suspected due to a RET mutation in familial forms, increased calcitonin levels in patients with thyroid nodules, clinical signs of metastatic disease, associated

© 2009 Elsevier Masson SAS. All rights reserved.

Keywords: Colon cancer; Medullary thyroid carcinoma; Calcitonin; FDG PET

Abstract

Objective. – We report a case of a medullary thyroid carcinoma discovered by F-18 fluorodeoxyglucose-positron emission tomography (F-18 FDG PET). Patient and methods. – A 73-year-old man with a history of surgical removal of sigmoid colon cancer underwent F-18 FDG PET to search for distant metastases and/or local recurrence because of elevated CEA level and new episode of occlusion. F-18 FDG PET images showed increased focal FDG uptake in the right lobe of the thyroid. Thyroid ultrasound showed one thyroid nodule in each lobe. Results. – The fine needle aspiration result was suspicious and calcitonin level was elevated. The subject underwent thyroidectomy without lymph node dissection. The pathology showed a 14 mm medullary thyroid carcinoma. There was no germline mutation of RET. Conclusions. – F-18 FDG PET can detect primitive or secondary malignant thyroid tumors. Thus, thyroid incidentaloma revealed by 18 FDG PET uptake always necessitates a careful evaluation.

© 2009 Elsevier Masson SAS. All rights reserved.

Keywords: Colon cancer; Medullary thyroid carcinoma; Calcitonin; FDG PET

1. Introduction

Medullary thyroid carcinoma (MTC) is an uncommon calcitonin neoplasm. It represents 3 to 8% of all thyroid cancers, but is responsible for up to 14% of all thyroid cancer deaths [1]. Sporadic cases most often occur after the fifth decade of life. Its prognosis is good with a 15-year survival rate of 70% [2]. Positive diagnosis of MTC is established on pathology, but could have been previously suspected due to a RET mutation in familial forms, increased calcitonin levels in patients with thyroid nodules, clinical signs of metastatic disease, associated

© 2009 Elsevier Masson SAS. All rights reserved.

Keywords: Colon cancer; Medullary thyroid carcinoma; Calcitonin; FDG PET
endocrinopathies, cervical lymph nodes, diarrhea, or flushes [3]. Early total thyroidectomy with cervical lymph node dissection is the gold standard therapy with cure in 60% of cases [4]. In this report, we describe a case of sporadic MTC detected by F-18 fluorodeoxyglucose positron emission tomography (F-18 FDG PET) in a patient with metastatic colonic cancer.

2. Case report

A 73-year-old man with past history of hypertension and hypercholesterolemia underwent surgery (sigmoidectomy) in November 2004 for a pT4N0M0 sigmoid adenocarcinoma revealed by obstruction. An adjunctive chemotherapy associating oxaliplatin, folinic acid and 5-fluorouracil (Folfox®) and bevacizumab was administered to the patient until June 2005 with secondary neuropathy and hypertension as side effects. During regular follow-up, distant metastasis and/or local recurrence were suspected because of elevated carcinoembryonic antigen (CEA) levels (9.4 ng/ml vs 5 ng/ml in 2004, normal value < 5 ng/ml) and a new episode of intestinal obstruction. F-18 FDG PET was performed and the PET images showed increased focal FDG uptake in the right iliac zone corresponding to colonic metastases and in the right lobe of the thyroid (SUV max 4.4) (Figs. 1A, B). After surgery of the peritoneal carcinosis, FDG uptake remained only in the thyroid. Thyroid palpation was unremarkable. The thyroid ultrasound revealed the presence of two thyroid nodules (right 18 mm, left 12 mm) (Fig. 2). The patient was in good condition. Because of a suspicious fine needle aspiration result in the right nodule and elevated calcitonin level (454 pg/ml, normal value < 10 pg/ml), the subject...
underwent total thyroidectomy. Lymph node resection was not performed as the overall prognosis was related to the metastatic colonic disease. Pathology showed a MTC of 14 mm without C cell hyperplasia (pT1NxM0) (Fig. 3). Postoperative calcitonin level was normal (< 2 pg/ml) and RET mutation was negative. The patient was alive in July 2009 in good condition.

3. Discussion

The North America prevalence of palpable thyroid nodules has been found to be between 3 and 7%. The prevalence has been reported to be as high as 50% based on ultrasound or autopsy data. Only 5% of nodules are malignant [5]. With 18 FDG thyroid incidentaloma, many challenges are presented. Is it a metastasis of the primary tumor or another primary (thyroid) cancer requiring another therapeutic strategy? Would it be appropriate to propose a treatment in the context of advanced cancer?

Previous reports have set the prevalence of thyroid FDG PET incidentalomas at 1.1 to 4.3% with a high risk of thyroid malignancy ranging from 14 to 50% but histological evidence of all 18 FDG thyroid foci was not always available [5–17] (Table 1). Diagnosed tumors are very often thyroid papillary carcinoma, followed by metastases from colonic adenocarcinoma, or other carcinoma such as esophageal cancer, breast cancer, squamous-cell cancer and lymphoma [10,12–14]. The high level of expression of GLUT 1 (a glucose transporter) in thyroid cancers could explain this uptake [8]. In most studies, SUV max was higher in thyroid cancer than in benign tumors. Moreover, Bosgrud et al. indicate than the SUV max was related to the degree of dedifferentiation of thyroid cancer [14].

Among these rare 18 FDG malignant thyroid incidentalomas, only seven MTC cases (including this case report) have been reported. Two cases were diagnosed in the context of elevated CEA plasma levels [8], a possible MTC marker [17] and for three, information was not available [18]. The last case was diagnosed in the context of a laryngeal cancer in a 73-year-old patient after identification of the thyroid nodule by CT scan [19].

Colonic carcinoma can metastasize to the thyroid with a 1.9 to 8.6% incidence in autopsy series. In one clinical series, there was a lower incidence of thyroid metastasis (0.1% of pathologically proven thyroid metastases in a study of 5862 patients) [20]. Thyroid metastasis of colonic carcinoma identified by F-18 FDG PET during cancer evaluation has been recently reported [21].

Table 1

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of 18 FDG scan in this center</th>
<th>Number of foci % of patients (focal)</th>
<th>Number of histology FNA ± TXT</th>
<th>Number of cancer Histology of cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>[7]</td>
<td>4525</td>
<td>102 (2.3%)</td>
<td>15 FNA</td>
<td>PTC n = 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hurthle cell cancer n = 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Poorly differentiated cancer n = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>and atypical cells n = 1</td>
</tr>
<tr>
<td>[9]</td>
<td>1330</td>
<td>29 (2.2%)</td>
<td>15 FNA</td>
<td>PTC n = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8 + TXT</td>
<td>Follicular carcinoma n = 1</td>
</tr>
<tr>
<td>[10]</td>
<td>4136</td>
<td>45 (1.1%)</td>
<td>32 FNA</td>
<td>PTC n = 16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 + TXT</td>
<td>Metastasis n = 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Follicular carcinoma n = 2</td>
</tr>
<tr>
<td>[11]</td>
<td>4803</td>
<td>60 (1.2%)</td>
<td>50 FNA</td>
<td>PTC n = 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 + TXT</td>
<td></td>
</tr>
<tr>
<td>[12]</td>
<td>1763</td>
<td>70 (4%)</td>
<td>29 FNA</td>
<td>PTC n = 16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 + TXT</td>
<td>Metastasis n = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lymphoma n = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[6]</td>
<td>689</td>
<td>19 (2.8%)</td>
<td>12 FNA</td>
<td>PTC n = 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6 + TXT</td>
<td>Follicular carcinoma n = 1</td>
</tr>
<tr>
<td>[13]</td>
<td>11500</td>
<td>377 (2.1%)</td>
<td>61 FNA</td>
<td>PTC n = 21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>32 + TXT</td>
<td>Poorly differentiated cancer n = 1</td>
</tr>
<tr>
<td>[14]</td>
<td>7347</td>
<td>79 (1.1%)</td>
<td>48 FNA</td>
<td>PTC n = 12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 + TXT</td>
<td>Follicular carcinoma n = 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Metastasis n = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lymphoma n = 2</td>
</tr>
<tr>
<td>Total</td>
<td>42474</td>
<td>864 (2%)</td>
<td>281 FNA</td>
<td>110 cancers (39%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>83 + TXT</td>
<td>92 PTC (33%)</td>
</tr>
</tbody>
</table>

PTC: papillary thyroid carcinoma; MTC: medullary thyroid carcinoma; FNA: fine needle aspiration; + TXT: FNA with thyroidectomy; %: percentage of malignant tumors.

NA : non disponible ; PTC : cancer papillaire de la thyroïde ; MTC : cancer médullaire de la thyroïde ; FNA : cytoponction à l’aiguille fine ; + TXT : cytoponction avec thyroidectomie ; % : pourcentage de lésions malignes.
Thus, thyroid F-18 FDG PET uptake has to be considered as highly suspicious.

In MTC, some published studies have reported the use of F-18 FDG PET in the detection of MTC metastasis. In 55 consecutive cases of MTC with elevated calcitonin, Giraudet et al. indicated that 18 FDG PET scan appeared to be less sensitive and of lower prognostic value in comparison with other imaging methods (neck and abdomen ultrasonography; neck, chest, and abdomen spiral computed tomography; liver and whole-body magnetic resonance imaging; bone scintigraphy) [22]. This study revealed MTC foci only in 32/55 patients depending on body localization. In another study, focused on high-risk patients with rapidly progressing MTC, sensitivity of FDG PET/CT was 76%, with the best results for neck (83%) and mediastinal (85%) lesions. The uptake value was significantly correlated with short serum calcitonin level doubling time [23]. Thus, this tool is useful in detecting recurrent or occult metastatic diseases in MTC patients.

There are no studies demonstrating increased association of MTC and colonic cancer. Only the increased relative risk of thyroid and pancreatic cancers has been demonstrated in familial adenomatous polyposis [24]. Rarely their histories could be linked, probably because colonic cancer is the first cancer and it shares a common tumor marker with MTC: CEA. Martinez et al. reported the detection of MTC by calcitonin determination in a 44-year-old woman after surgery for colonic cancer in the context of increased CEA levels [25].

Thus, in case of thyroid F-18 FDG PET uptake, one malignancy can mask another. Calcitonin measurement in all patients with FDG thyroid incidentaloma could be a rapidly informative test, without an excessive cost. Calcitonin determination, thyroid ultrasound, and fine needle aspiration of the thyroid are therefore necessary.

4. Conflicts of interest

None to declare.

Acknowledgement

We would like to express our gratitude to Dr Elif Hindie for his expert help.

References


