Lung Adenocarcinoma Staged as an Unknown Primary Presenting with Symptomatic Colon Metastases: Staging by ^{18}F -FDG PET/CT

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Abstract A 66-year-old man, who presented with bright red blood per rectum, was referred for an ^{18}F -FDG PET/CT after colonoscopy showed two suspicious colon masses, which were biopsied to reveal an adenocarcinoma of unknown origin. PET/CT showed two intensely FDG-avid colon masses as well as an unsuspected FDG-avid lung mass, which was biopsied to reveal a primary lung adenocarcinoma. Immunohistochemistry confirmed the two colon metastases were of pulmonary origin. It is extremely rare for lung carcinoma to present with symptomatic colon metastases, with only 11 cases described in the literature. We report the first case of the utility of ^{18}F -FDG PET/CT in staging a patient who presented with symptomatic colon metastases of an unknown primary lung malignancy.

Keywords Lung adenocarcinoma · Colon metastases · Fluorodeoxyglucose · FDG · PET/CT

Introduction

Lung carcinoma is the leading cause of cancer death, and about 50% of patients have distant metastases at the time of

diagnosis. The most common sites of extrapulmonary metastasis are the lymph nodes, liver, adrenal gland, bone, and brain. Colon metastases from lung carcinoma are very rare, and usually occur late in the disease, after the primary diagnosis has been established. In the past 20 years, only 11 cases of symptomatic colon metastases from lung malignancies of all types have been reported in the literature [1–6]. The use of ^{18}F -FDG PET/CT in the evaluation of a solitary pulmonary nodule is well established in the literature [7–13]. In this rare case, we present the utility of ^{18}F -FDG PET/CT in detecting an unsuspected lung adenocarcinoma in a patient who presented with symptomatic colon metastases from an unknown primary malignancy.

Case Report

A 66-year-old man with a smoking history of one pack per week for 40 years presented with bright red blood per rectum. Colonoscopy showed two suspicious masses in the colon, one in the splenic flexure and the other in the upper rectum. The patient was referred for a staging ^{18}F -FDG PET/CT (Discovery ST, GE Healthcare, Canada) after biopsies and histological evaluation of the colon masses revealed a poorly differentiated adenocarcinoma of unknown origin.

Maximum intensity projection (MIP) images (Fig. 1) showed a 6 cm mass in the splenic flexure region of the colon with maximum standardized uptake value (SUV_{max}) of 10.2 (Fig. 2). There was also a 4.5 cm mass in the rectum with SUV_{max} of 15.0 (Fig. 3). Incidental note was made of a 2.5 cm left upper lung mass with SUV_{max} of 11.8, and a 2.2 cm right adrenal nodule with SUV_{max} of 6.4 (Fig. 4). Following the PET/CT, the patient had surgical resection of both colon masses.

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Fig. 1 ^{18}F -FDG PET/CT maximum intensity projection (MIP) images with anterior and left lateral views show intensely FDG-avid lesions in the rectum, splenic flexure, left upper lung, and right adrenal (*arrow*)

Histopathological evaluation of the splenic flexure colon mass showed a 7 cm mass with transmural extension and involvement of serosa. Lymphovascular invasion was present, and all 11 local lymph nodes were negative for malignancy. The upper rectal mass measured 5.5 cm and extended transmurally into the subserosa, with presence of lymphovascular invasion, and all 10 local lymph nodes were negative for malignancy. The tumors were diagnosed

as a poorly differentiated adenocarcinoma with signet ring cells. Immunostaining showed cytokeratin 7 (CK7) positive and cytokeratin 20 (CK20) negative. This was unusual for a colorectal primary, which are usually CK7 negative and CD20 positive [1]. There was also absence of a clear origin of the tumors from the surface colonic mucosa, hence the tumors were interpreted to be metastatic, and a search for the primary was undertaken. The patient had a gastroscopy to rule out a gastric primary but no tumor was seen during the investigation. A decision was then made to resect the lung mass as well.

The patient had a left upper lung lobectomy (with a portion of the superior segment of the left lower lobe) 5 months following the resection of the colon masses. On cut sections, a firm white-tan multilobulated and partially hemorrhagic tumor was identified involving both the upper lobe and the superior segment of the lower lobe, measuring $4.5 \times 4.0 \times 3.0$ cm. The tumor was a moderately to poorly differentiated adenocarcinoma (acinar pattern) that extended across the pleura into the superior segment of the left lower lobe. The histologic appearance of the lung tumor was similar to the two separately resected colon adenocarcinomas. Immunohistochemistry showed a strong positive reaction for CK 7, moderate to strong positive reaction for TTF-1, and a

Fig. 2 Transaxial and coronal views of the abdomen of the **a** CT portion of the PET/CT, **b** PET, and **c** PET/CT fusion images show a 6 cm colon mass at the splenic flexure with SUV_{max} 10.2

Fig. 3 Transaxial and sagittal views of the abdomen of the **a** CT portion of the PET/CT, **b** PET, and **c** PET/CT fusion images show a 4.5 cm rectal mass with SUV_{max} 15.0

Fig. 4 Transaxial views of the chest and upper abdomen of the **a** CT portion of the PET/CT, **b** PET, and **c** PET/CT fusion images show an incidental 2.5 cm left upper lung mass with SUV_{max} of 11.8, and a 2.2 cm right adrenal nodule with SUV_{max} of 6.4

negative reaction for CK 20. Additional TTF-1 immunostaining was performed on the colon tumors, showing a focal moderately positive reaction in one of the colon tumors. These findings confirmed the diagnosis of a lung adenocarcinoma primary with two colon metastases.

The patient had a follow-up CT of the abdomen and pelvis to re-evaluate the FDG-avid right adrenal nodule first noticed on the staging PET/CT 8 months prior. The adrenal nodule had grown from 2.2 cm to a 10.2 cm predominantly cystic mass, with a solid portion that enhanced with contrast, compatible with an adrenal metastasis (Fig. 5a). Several sclerotic foci were seen in the vertebral bodies of T8 and T11, and the patient was referred for a ^{99m}Tc -MDP bone scan to evaluate for bone metastases. A whole body ^{99m}Tc -MDP bone scan showed extensive metastatic disease in the axial skeleton and proximal femora (Fig. 5b). The patient had been feeling generally well, complaining only of some sensitivity in the upper anterior chest wall, likely caused by the sternal bone metastases.

Discussion

Lung carcinoma is the leading cause of cancer death, and about 50% of patients have distant metastases at the time of diagnosis. The most common sites of extrapulmonary metastasis are the lymph nodes, liver, adrenal gland, bone, and brain. Colon metastases from lung carcinoma are very rare, and usually occur late in the disease, after the primary diagnosis has been established [2]. The most common presenting symptoms are abdominal pain, nausea, vomiting, anemia, and weight loss. Other symptoms such as colonic obstruction, lower GI bleeding, bowel perforation, or GI fistula may occur [3–5].

In the past 20 years only 11 cases of symptomatic colon metastases from lung malignancies of all types have been reported in the literature [6]. When examining the development of colon metastases from other primaries, in many cases the patients had a past history of colon disease (or an incidental polyp) suggesting some form of underlying disposition. There is also a predilection to metastasize to the splenic flexure specifically, although the mechanism or reason for this is currently unknown [11]. Lung adenocarcinoma with intestinal metastases has been reported to have a poor prognosis with mean survival of only 4–8 weeks [12]. Although the detection of a colon metastasis by ^{18}F -FDG PET/CT during the staging of a lung cancer has been noted in the literature [13], this is the first report of the use of ^{18}F -FDG PET/CT to stage an unsuspected lung cancer, prompted by the presentation of symptomatic multiple colon metastases of an unknown primary.

In conclusion, this case highlights the usefulness of ^{18}F -FDG PET/CT in detecting and staging an unsuspected

Fig. 5 **a** A follow-up contrast-enhanced CT of the abdomen showed an increase in size of the adrenal nodule to 10.2 from 2.2 cm, which was predominantly cystic with an enhancing solid component, compatible with an adrenal metastasis. **b** A whole body ^{99m}Tc -MDP bone scan showed extensive metastatic bone disease in the axial skeleton and proximal femora

primary lung adenocarcinoma in a patient who presented with multiple symptomatic colon metastases.

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References

1. Park SY, Kim HS, Hong EK, Kim WH. Expression of cytokeratins 7 and 20 in primary carcinomas of the stomach and colorectum and their value in the differential diagnosis of metastatic carcinomas to the ovary. *Human Pathol.* 2002;33:1078–85.
2. Weng MW, Wang HC, Chiou JC, Lin SL, Lai RS. Colonic metastasis from a primary adenocarcinoma of the lung presenting with acute abdominal pain: a case report. *Kaohsiung J Med Sci.* 2010;26:40–4.
3. Hirasaki S, Suzuki S, Umemura S, Kamei H, Okuda M, Kudo K. Asymptomatic colonic metastases from primary squamous cell carcinoma of the lung with a positive fecal occult blood test. *World J Gastroenterol.* 2008;14:5481–3.
4. Lau CP, Leung WK. Caecal metastasis from a primary small-cell lung carcinoma. *Hong Kong Med J.* 2008;14:152–3.
5. Garwood RA, Sawyer MD, Ledesma EJ, Foley E, Claridge JA. A case and review of bowel perforation secondary to metastatic lung cancer. *Am Surg.* 2005;71:110–6.
6. Carroll D, Rajesh PB. Colonic metastases from primary squamous cell carcinoma of the lung. *Eur J Cardiothorac Surg.* 2001;19:719–20.
7. Gauger J, Patz EF, Coleman RE, Herndon JE. Clinical stage I non-small cell lung cancer including FDG-PET imaging: sites and time to recurrence. *J Thorac Imaging.* 2007;2:499–505.
8. Hoang JK, Hoagland LF, Coleman RE, Coan AD, Herndon JE, Patz EF. Prognostic value of fluorine-18 fluorodeoxyglucose positron emission tomography imaging in patients with advanced-stage non-small-cell lung carcinoma. *J Clin Oncol.* 2008;26:1459–64.
9. Shim SS, Lee KS, Kim BT, Chung MJ, Lee EJ, Han J, et al. Non-small cell lung cancer: prospective comparison of integrated FDG PET/CT and CT alone for preoperative staging. *Radiology.* 2005;236:1011–9.
10. De Geus-Oei LF, van der Heijden H, Corstens F, Oyen W. Predictive and prognostic value of FDG-PET in nonsmall-cell lung cancer. *Cancer.* 2007;110:1654–64.
11. Carr CS, Boulos PB. Two cases of solitary metastases from carcinoma of the lung presenting as primary colonic tumours. *Br J Surg.* 1996;83:647.
12. Polak M, Kupryjanczyk J, Rell KW. A rare case of colonic perforation in a sole site of latent lung cancer metastasis. *Pol Tyg Lek.* 1990;45:179–81.
13. Stinchcombe TE, Socinski MA, Gangarosa LM, Khandani AH. Lung cancer presenting with a solitary colon metastasis detected on positron emission tomography scan. *J Clin Oncol.* 2006;24:4939–40.