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CASE REPORT

A case of small-cell lung cancer with recurrence of solitary pancreatic metastasis detected by FDG-PET/CT

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Abstract A 63-year-old man visited an outpatient clinic complaining of 3-month continuous cough and left chest pain. He was diagnosed as having small-cell lung cancer with limited disease in the left lung by the bronchoscopy, enhanced CT, FDG-PET/CT and enhanced brain MRI. He received a regime of chemotherapy consisting of six cycles of carboplatin and etoposide with concurrent radiation therapy of 60 Gy. He was evaluated as showing complete response, and prophylactic cranial irradiation was performed. Nine months later, while routine enhanced CT could not detect obvious relapse in the pancreas, abnormal uptake at the pancreas head was detected in fluorine-18 fluorodeoxyglucose positron emission tomography (F-18-FDG-PET)/computed tomography (CT). Transgastric endoscopic ultrasound-guided fine-needle aspiration biopsy of the pancreas head was carried out, which showed small-cell carcinoma. Immunohistochemical staining was positive for thyroid transcription factor-1, synaptophysin, chromogranin A and notably of AE1/AE3. Thus, the patient was diagnosed as having a recurrence of small-cell lung cancer with pancreatic metastasis. He received another four cycles of carboplatin and etoposide for sensitive relapse. The tumor was diminished and showed partial response. We have to be aware of the possibility of solitary metastasis to the pancreas from lung cancer. FDG-PET/CT may be useful for early detection of pancreatic metastasis, leading to the early diagnosis and precise therapy.

Keywords Small-cell lung cancer · Pancreatic metastasis · FDG-PET/CT

Introduction

Solitary metastasis to the pancreas is rare in small-cell lung cancer. It is important to recognize pancreatic metastasis because in some cases it has caused serious complications such as acute pancreatitis or obstructive jaundice [1, 2]. Recently, fluorine-18 fluorodeoxyglucose positron emission tomography (F-18-FDG-PET)/computed tomography (CT) systems, which enable PET and CT data acquisition in the same setting without changing the patient's positioning, have been introduced in clinical practice for the purpose of the detection of metastasis in malignancies [3, 4]. However, the studies or cases reported in terms of the usefulness of PET/CT in differentiating pancreatic metastasis from lung cancers are rare. We present a case of small-cell lung cancer with recurrence of pancreatic metastasis detected by FDG-PET/CT.

Case report

A 63-year-old man visited an outpatient clinic complaining of 3-month continuous cough and left chest pain. He had a 42-pack-years smoking history. He was diagnosed as having small-cell lung cancer with limited disease in the left lung by the bronchoscopy, enhanced CT, FDG-PET/CT and enhanced brain MRI. He received a regime of

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Table 1 Laboratory findings on the recurrence of the lung cancer

Hematology		*Biochemistry*		*Tumor marker*	
WBC	6300/μl	BUN	16 mg/dl	CEA	1.8 ng/ml
Nuetro	60.4 %	Cr	0.8 mg/dl	NSE	5.2 ng/ml
Lympho	24.4 %	Na	141 mEq/l	Pro-GRP	26.0 pg/ml
Mono	6.4 %	K	4.3 mEq/l	CA-19-9	7.1 U/ml
Eosino	8.3 %	Cl	105 mEq/l	DUPAN-2	32 U/ml
Hb	11.9 mg/dl	Alb	4.2 g/dl		
MCV	90.4 fl	AST	9 IU/l		
MCHC	31.5 %	ALT	8 IU/l		
Plt	34.1 × 10^4/μl	LDH	144 IU/l		
		ALP	328 IU/l		
		T-bil	0.4 mg/dl		
		Amy	89 IU/l		
		CRP	0.45 mg/dl		

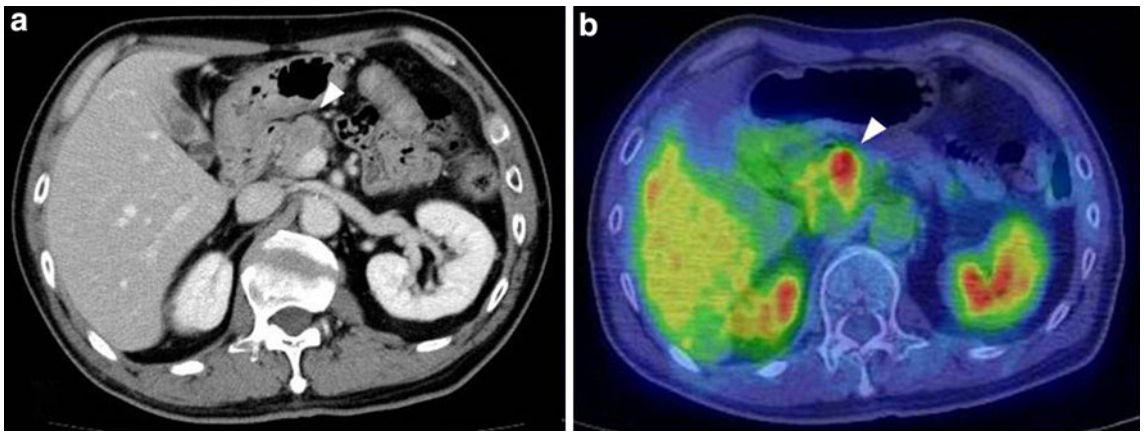

Fig. 1 **a** Routine enhanced CT could not detect the relapse in the pancreas. **b** Abnormal uptake was detected with pancreas in FDG-PET/CT

chemotherapy consisting of six cycles of carboplatin and etoposide with concurrent radiation therapy of 60 Gy. He was evaluated as having complete response, and prophylactic cranial irradiation was performed. Nine months later, abnormal uptake at the pancreas head was detected in FDG-PET/CT scan.

Findings at that time were height 159.2 cm, body weight 53 kg, blood pressure 136/75 mmHg, pulse rate 78/min regular, respiratory rate 16/min and body temperature 36.0 °C. Breath sounds were decreased in the left lung, and no cardiac abnormal murmurs were heard on chest auscultation. There was no pain in the abdomen. Laboratory findings revealed no elevation of hepatobiliary markers or amylase. Tumor marker levels were normal (Table 1). While routine enhanced CT could not detect obvious relapse in the pancreas (Fig. 1a), the maximum standardized uptake value (SUV_{max}) of the pancreas head was 5.46 on FDG-PET/CT (Fig. 1b). Magnetic resonance imaging (MRI) revealed a 22 × 20-mm solitary tumor on the pancreas head without the dilatation of the main pancreatic duct distal to the tumor. A 24.9 × 22.4-mm tumor with low echo was visualized on endoscopic ultrasonography (EUS). Transgastric endoscopic ultrasound-guided fine-needle aspiration biopsy (EUS-FNA) of the pancreas head was carried out, which showed small-cell carcinoma. Immunohistochemical staining was positive for thyroid transcription factor-1 (TTF-1), synaptophysin, chromogranin A and notably AE1/AE3 (Fig. 2). Thus, the patient was diagnosed as having a recurrence of small-cell lung cancer with pancreatic metastasis. He received another four cycles of carboplatin and etoposide for sensitive relapse. The tumor was diminished and showed partial response (PR) (Fig. 3).

Discussion

Metastasis to the pancreas is rare, found at autopsy in 3–12 % of patients with advanced malignancy [5]. Clinical and autopsy data indicate that a wide variety of nonlymphomatous primary tumors may metastasize to the pancreas [5, 6]. In most studies, lung cancer is the most frequent type of malignancy causing pancreatic metastasis

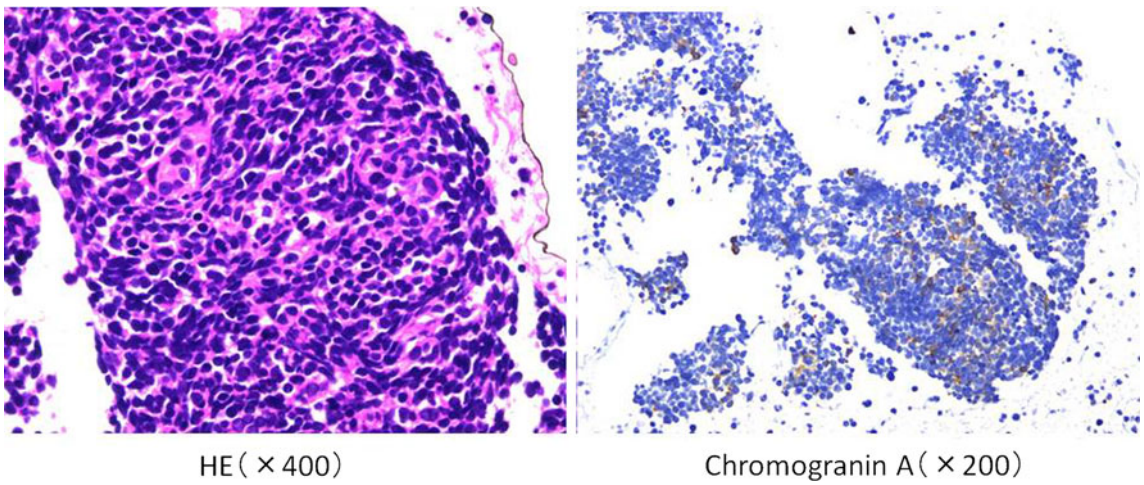

Fig. 2 H&E and immunohistochemical staining of specimens from the EUS-FNA of pancreas head

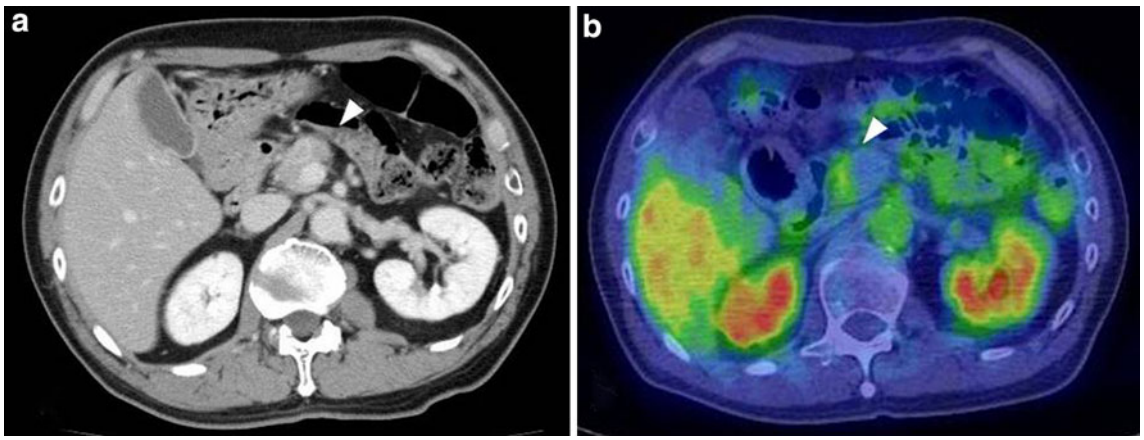

Fig. 3 **a** Enhanced CT finding of the pancreas after four cycles of chemotherapy. **b** FDG-PET/CT finding of the pancreas after four cycles of chemotherapy

(18–27 %), followed by renal cell carcinoma, breast carcinoma, colorectal cancer and hepatobiliary tract cancer. Regarding lung cancer, small-cell carcinoma is the most frequent histological type of malignancy that metastasized to the pancreas (10 %), followed by adenocarcinoma (2.4 %), large cell carcinoma (1.9 %) and finally squamous cell carcinoma with an incidence of 1.1 % [6]. Seki et al. [7] reported that additional intraabdominal sites, mostly hepatic and adrenal glands, were observed in 97 % of lung tumor cases presenting with metastasis to the pancreas. In Japan, only four cases of solitary metastasis to the pancreas as our case were included in the literature [8, 9]. Because of the asymptomatic character of metastasis to the pancreas, many patients are in advanced stage at the time of diagnosis. It is important to recognize pancreatic metastasis because in some cases it has caused serious complications such as acute pancreatitis or obstructive jaundice [1, 2], and the recognition of pancreatic metastasis will contribute to early and precise diagnosis of the symptoms related to these conditions and allow immediate appropriate therapy. Therefore, precise recognition of pancreatic metastasis in lung cancer patients is important for adequate patient management.

FDG-PET/CT is a powerful diagnostic tool for detecting and characterizing metastatic tumors of lung cancer [4]. Sato et al. [10] reported the usefulness of FDG-PET/CT in the detection of pancreatic metastasis from lung cancer. In the study, abnormal accumulations in the pancreas were detected in 11 (1.92 %) of 573 lung cancer patients who underwent FDG-PET/CT. In 3 of the 11 patients, pancreatic lesions were not visualized by routine transaxial CT. In our case, FDG-PET/CT revealed distinct abnormal accumulation in the pancreas although enhanced CT could not detect obvious relapse. Early detection of pancreatic metastasis by FDG-PET/CT allowed initiating prompt therapy before complications occurred.

Routine use of FDG-PET/CT is reported to be useful for monitoring, response evaluation and detection of bone metastasis in patients with small-cell lung cancer [11, 12]. However, controversy still exists regarding the application of PET/CT in clinical practice, mainly because of its expense. It is evident that, apart from additional costs, potential savings are associated with PET/CT as a result of avoiding additional imaging examinations or invasive procedures and potentially resultant intensive care unit costs when necessary, and its use will help clinicians make optimum treatment decisions. Cost effectiveness in the follow-up of non-small-cell lung cancer was reported by van Loon et al. [13]. The cost-utility analysis was based on the Markov model, with a hypothetical cohort of NSCLC patients treated with curative radiotherapy with or without chemotherapy and a 5-year time horizon. The authors found that the PET/CT-based follow-up was potentially cost-effective and was economically more attractive than the CT-based follow-up, especially in the subgroup of asymptomatic patients. We think asymptomatic patients with complete response small-cell lung cancer can undergo FDG-PET/CT as a follow-up examination after first line chemotherapy, thereby allowing us to detect asymptomatic distant metastases.

In conclusion, we have to be aware of the possibility of solitary metastasis to the pancreas from lung cancer. FDG-PET/CT may be useful for early detection of pancreatic metastasis, leading to early diagnosis and precise therapy.

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Conflict of interest The authors declare that they have no conflict of interest.

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