

Surgical resection of solitary omental metastasis from non-small cell lung cancer: Report of three cases

YASUHIRO MATSUDA, YOSHIYUKI FUJIWARA, KENTARO KISHI, JIRO OKAMI, KEIJIRO SUGIMURA, MASAOKI MOTOORI, NORIKATSU MIYOSHI, SHINGO NOURA, MASAYUKI OHUE, KUNIHITO GOTOH, SHIGERU MARUBASHI, HIROFUMI AKITA, HIDENORI TAKAHASHI, MASATO SAKON and MASAHIKO YANO

Department of Surgery, Osaka Medical Center for Cancer and Cardiovascular Diseases,
Higashinari-ku, Osaka 537-8511, Japan

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Abstract. In the present study we report three cases of solitary omental metastasis from non-small cell lung cancer, which had been surgically resected at our institute. The primary site was resected in one patient (case 1) and the other two patients were treated with chemotherapy and demonstrated complete response (cases 2 and 3). The omental metastasis appeared 4 months after pneumonectomy in case 1. Two metachronous omental tumors appeared 55 and 79 months after the initial chemotherapy in case 2. In Case 3, an omental tumor appeared 6 months after chemotherapy. Case 1 succumbed to recurrence 8 months after the resection of the omental tumor. Case 2 survives with recurrent disease 8 months after resection of the second omental metastasis, and case 3 survives 6 months after resection of the omental tumor. Although omental metastasis from non-small cell lung cancer is extremely rare, it should be considered when a patient with history of lung cancer has a tumor around the stomach.

Introduction

Non-small cell lung cancer (NSCLC) is the most common neoplasm and remains the leading cause of cancer-related mortality worldwide (1). In 2008, a total of 1.6 million new cases of lung cancer were diagnosed worldwide, accounting for 13% of all cancer cases. Furthermore, lung cancer accounted for 1.4 million mortalities and 18% of all cancer-related mortalities worldwide in 2008 (1). The most common symptoms of lung cancer include fatigue, loss of appetite, shortness of breath, cough, pain and blood in the sputum (2). The majority of lung cancer cases (80%) are classified as NSCLC (3). Of these

patients, >65% present with locally advanced or metastatic disease (4). Surgical resection is the most effective treatment for early-stage NSCLC. However, despite complete surgical resection, 30-75% of patients with stage I-IIIa NSCLC suffer a relapse and succumb to the disease (1,5,6). The most common sites of recurrence are the regional lymph nodes, lung, liver, bone, brain and adrenal gland (7). We experienced three cases of rare solitary omental metastasis of NSCLC, which had been subjected to surgical resection.

This study describes the clinical characteristics and outcome of the three patients with solitary omental metastasis of NSCLC and also reviews the literature reported previously. The study was approved by the ethics committee of Osaka Medical Center for Cancer and Cardiovascular Diseases (Osaka, Japan), and written informed consent was obtained from the patient or the patient's family.

Case report

Case 1. A 72-year-old female with a history of cigarette smoking [Brinkman index (BI), 525] who had a left lower lobe lung cancer (squamous cell carcinoma) underwent left lower lobe resection and mediastinal lymph node dissection. Postoperative chemotherapy was not enforced. The solitary abdominal tumor was diagnosed with ¹⁸F-fluorodeoxyglucose positron emission tomography and computed tomography (PET/CT) 4 months after pneumonectomy and was referred to the Department of Surgery at the Osaka Medical Center for Cancer and Cardiovascular Diseases. Physical examination was not noteworthy. The laboratory examination revealed serum carcinoembryonic antigen (CEA) of 3.3 ng/dl (normal range, 0-5 ng/dl) and CA19-9 of 41 U/ml (normal range, <37 U/ml). A CT examination was performed and revealed an enhanced solitary tumor measuring 30x26 mm around the stomach (Fig. 1A). The maximum standardized uptake value (SUV Max) was 4.055 on the PET/CT (Fig. 1B). Laparotomy was performed and a tumor was detected in the greater omentum, which had invaded into the transverse colon. The tumor was resected, and partial resection of the transverse colon was also performed. Histopathological examination with hematoxylin and eosin revealed poorly differentiated invasive squamous cell carcinoma. The patient was followed

Correspondence to: Dr Yoshiyuki Fujiwara, Department of Surgery, Osaka Medical Center for Cancer and Cardiovascular Disease, 1-3-3 Nakamichi, Higashinari-ku, Osaka 537-8511, Japan
E-mail: fujiwara-yo@mc.pref.osaka.jp

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Table I. Characteristics and treatment of primary non-small cell lung cancer.

No.	First author (ref.)	Age	Gender	Histological type	Stage	Treatment for primary tumor	Time to metastasis
1	Nakamura <i>et al</i> (8)	61	M	Large cell carcinoma	IV	Resection	0
2	Oshika <i>et al</i> (9)	44	M	Large cell carcinoma	IV	Resection	0
3		60	M	Adenocarcinoma	IB	Resection	0
4	Tamura <i>et al</i> (10)	50	M	Pleomorphic carcinoma	IA	Resection	5 months
5	Present case 1	72	F	Squamous cell carcinoma	IB	Resection	4 months
6	Present case 2	64	M	Pleomorphic carcinoma	IIIB	Chemotherapy; radiation ^a	46 months ^b
7	Present case 3	59	M	Pleomorphic carcinoma	IIIB	Chemoradiation	6 months

M, male; F, female. ^aThe present case 2 had radiation therapy for lymph node metastases 14 months after initial chemotherapy. ^bFirst omental recurrence was confirmed 46 months after the treatment of primary non-small cell lung cancer.

Table II. Treatment outcome of solitary omental metastasis from non-small cell lung cancer.

No.	Treatment for omental tumor	Infiltration	Recurrence following omentectomy		Outcome ^c
			Period ^a	Treatment	
1	Resection; chemoradiation	None		None	13 months (relapse-free)
2	Resection; chemotherapy	None		None	14 months (relapse-free)
3	Resection; chemotherapy	None		None	14 months (relapse-free)
4	Resection	None	3 weeks	None	7 months, deceased
5	Resection	Colon	3 months	None	8 months, deceased
6	Resection	None	24 months ^b	Resection	40 months, alive
	Resection	None	8 months	Chemotherapy	with recurrence ^d
7	Resection; chemotherapy	Stomach, pancreas	None	Chemotherapy	20 months, alive with recurrence

^aTime to recurrence from omentectomy. ^bSecond omental recurrence was resected after 24 months after resection of the first omental metastasis. ^cClinical outcome following resection of omental tumor. ^dCase 2 was alive with recurrence 40 months after resection of the first omental tumor.

up without postoperative chemotherapy and succumbed to recurrent disease in the mesenteric lymph nodes, liver, lung and peritoneum 8 months after the second surgery.

Case 2. A 64-year-old male with a history of cigarette smoking (BI, 500) who had a cancer of the left pulmonary hilum (pleomorphic carcinoma) underwent chemotherapy. The first regimen, which included cisplatin (CDDP; 80 mg/m²) plus vinorelbine (VNR; 25 mg/m²), was stopped due to the occurrence of diarrhea. The second regimen was carboplatin (area under the plasma concentration time curve 5) plus gemcitabine (1,000 mg/m²). The patient suffered a recurrence in the mediastinal lymph node 14 months after chemotherapy and radiation therapy (60 Gy/30 fr) was performed. The metastatic lymph node demonstrated a complete response. A solitary omental tumor appeared 46 months and 70 months after the initial start of treatment and the patient was subjected to surgery twice. Physical examination was not noteworthy. The laboratory examination revealed a CEA of 20.6 ng/ml and a CA19-9 of 5 U/ml at the first recurrence. The second

recurrent case revealed a CEA of 14.3 ng/ml and a CA19-9 of 12 U/ml. A CT scan revealed an abdominal tumor measuring 34x23 mm around the stomach for the first time (Fig. 2A). The SUV Max for the first recurrent omental tumor was 8.944 from the PET/CT (Fig. 2B). The second recurrence appeared beside the transverse colon as a 30x25-mm enhanced tumor. Laparotomy was performed twice and each solitary nodule was identified in the greater omentum. The histological examination confirmed that the omental tumor was a metastasis from lung pleomorphic carcinoma. The second recurrent tumor was also identical to the primary pleomorphic lung carcinoma. Eight months after the second surgery, recurrent tumors appeared in the pancreas, para-aortic lymph nodes and the peritoneum, and the patient underwent chemotherapy (pemetrexed; 500 mg/m²).

Case 3. A 59-year-old male with a history of cigarette smoking (BI, 1140) who suffered a cancer of the left pulmonary hilum (pleomorphic carcinoma) underwent chemotherapy. The regimens used were CDDP (80 mg/m²) plus VNR (25 mg/m²).

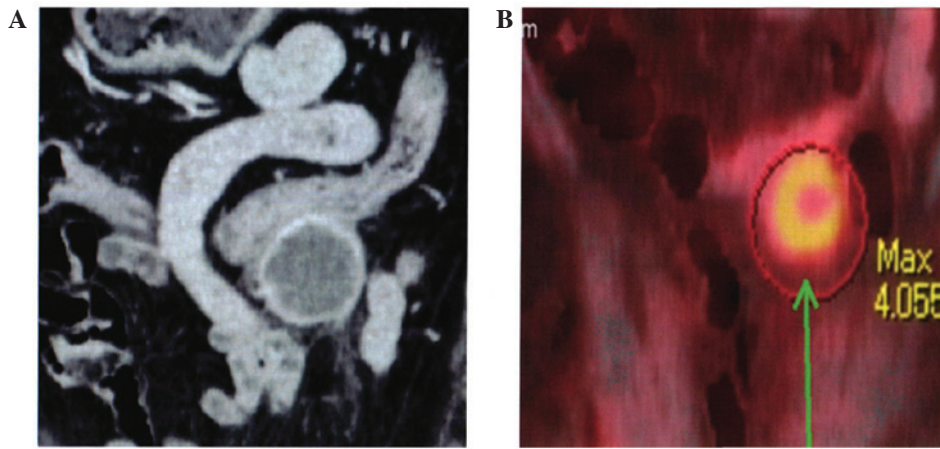


Figure 1. (A) Enhanced computed tomography revealed a tumor adjacent to the transverse colon. (B) ¹⁸F-fluorodeoxyglucose (FDG) accumulation was observed at the same site with FDG positron emission tomography/computed tomography (arrow indicates omental metastatic tumor).

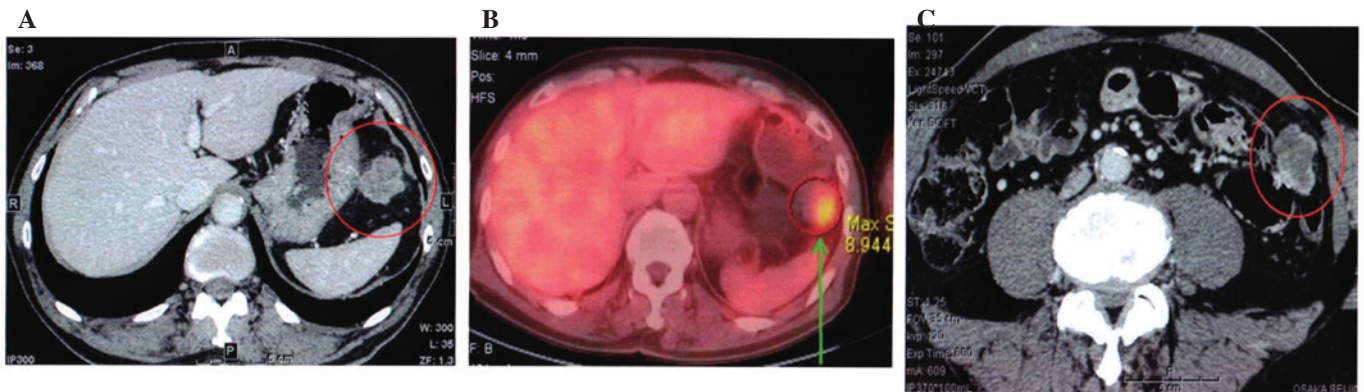


Figure 2. (A) Enhanced computed tomography revealed a tumor adjacent to the stomach. (B) ¹⁸F-fluorodeoxyglucose (FDG) accumulation was observed at the same site with FDG positron emission tomography/computed tomography (arrow indicates omental metastatic tumor). (C) Enhanced computed tomography revealed a tumor adjacent to the transverse colon.

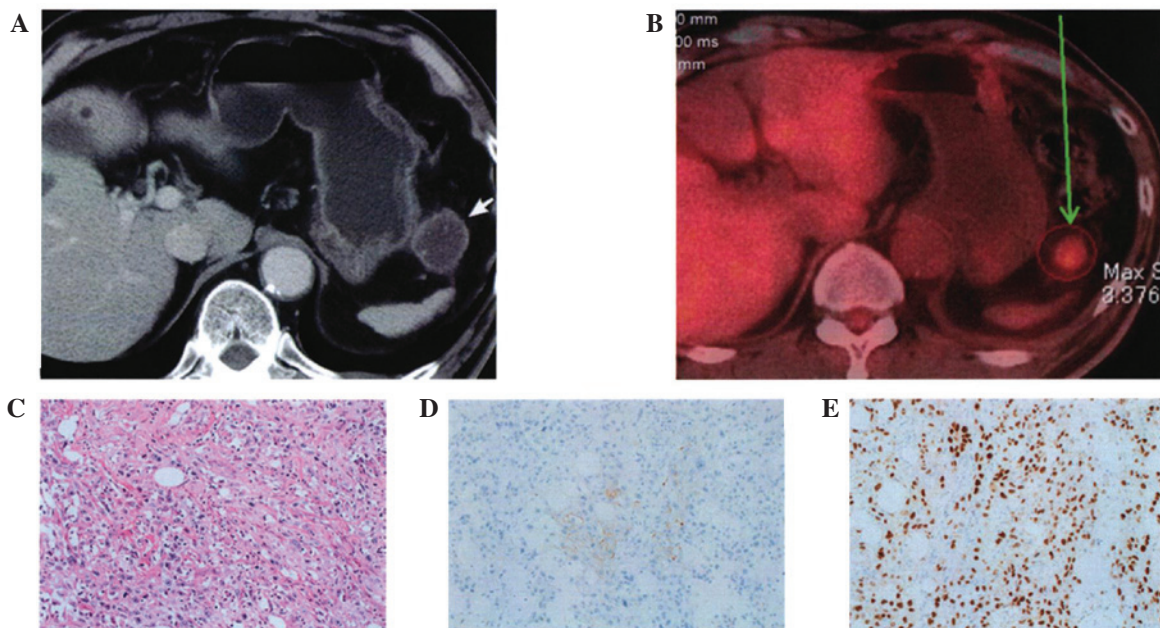


Figure 3. (A) Enhanced computed tomography revealed a tumor adjacent to the stomach. (B) ¹⁸F-fluorodeoxyglucose (FDG) accumulation was observed at the same site with FDG positron emission tomography/computed tomography (arrow indicates omental metastatic tumor). (C) Photomicrogram of omental tumor specimen with hematoxylin and eosin staining (magnification, x400). (D) Immunohistochemical analysis revealed cytokeratin 5/6 positivity for tumor cells (magnification, x400). (E) Immunohistochemical analysis revealed p63 positivity for tumor cells (magnification, x400).

A solitary abdominal tumor was detected with CT 6 months after the start of chemotherapy, and the patient was referred for surgery. Physical examination was not noteworthy. Laboratory studies revealed a CEA of 1.7 ng/ml, cytokeratin 19 fragment of 12 U/ml (normal range, 0-2.8 ng/ml) and neuron specific enolase of 11.6 ng/ml (normal range, <16.3 ng/ml). CT examination revealed an intra-peritoneal tumor measuring 28x26 mm around the stomach (Fig. 3A). The SUV Max was 3.376 with PET/CT (Fig. 3B). The tumor had infiltrated into the stomach wall and pancreas tail, and it was resected with a combination of partial gastrectomy, distal pancreatectomy and splenectomy. The histological examination revealed that tumor cells had invaded into the spleen, pancreas and stomach wall, accompanied by massive vascular invasion. The tumor cells were composed of spindle-shaped polygonal tumor cells and demonstrated no clear differentiation trend (Fig. 3C). Immunohistochemical examination revealed that the tumor cells expressed vimentin cytokeratin 5/6, anti-cytokeratin CAM5.2 and p63, but did not express TTF-1 and Napsin A (Fig. 3D and E). Postoperative chemotherapy (S-1, 80 mg/m²) was performed. The patient demonstrated no recurrence 20 months after surgery.

Discussion

In this study, we have reported three cases of an extremely rare solitary metastatic omental tumor from NSCLC, which had been surgically resected at our department. The three cases that we experienced were incidentally diagnosed with CT and/or PET-CT and had no symptoms. There have only been a few studies of solitary omental metastasis from NSCLC. Therefore, we reviewed a total of seven cases, comprising four cases reported in the past (8-10) and our three cases. The characteristics of the patients as well as the treatment administered and the outcome of treatment are shown in Tables I and II. The mean age of patients was 58.6 (44-72) years old. The male to female ratio was 6:1. A history of smoking was observed in all patients. Surgical resection for omental tumors was performed in all cases. The histology of the primary site revealed pleomorphic carcinoma in three cases out of seven (43%). Considering that pleomorphic carcinoma in NSCLC is extremely rare (0.3% of all lung cancers), omental metastasis is assumed to be relatively common in pleomorphic carcinoma of the lung (11). Pulmonary pleomorphic carcinoma was identified as a specific type of lung cancer with pleomorphic sarcomatoid or sarcomatous elements by the 1999 World Health Organization classification (12). Pulmonary pleomorphic carcinoma has a more aggressive clinical course and demonstrates a poorer outcome than other NSCLCs (11,13,14). Fujiwara *et al* reported on cases of gastrointestinal metastasis of NSCLCs (15). These authors reported that three cases out of nine with gastrointestinal metastasis revealed a histology of pleomorphic carcinoma. These results indicate that pulmonary pleomorphic carcinoma has a tendency to metastasize to the abdominal region. Previous studies reveal that the common extrathoracic metastatic sites are the brain (32%), bone (23%), liver (9%), adrenal gland (6%) and gastrointestinal tracts (0.5%) (7,15,16). Omental metastasis of NSCLC is extremely rare and studies of solitary omental metastasis which were subjected to surgery are few. Omental metastasis from NSCLC is considered to be formed through the vascular or lymphatic vessels. Oshika and Hashimoto reported on two

patients who suffered gastric wall metastasis following resection of omental metastasis, which may indicate that lung cancer cells first metastasize to the gastric wall through the vascular vessels and then metastasize to the omentum through the lymphatic vessels (9). Stomach metastasis from NSCLC is also extremely rare and there have been few studies to date (17,18).

Due to the limited number of cases with solitary omental metastasis, the significance of the surgical approach for solitary omental carcinoma remains unclear. Table II reveals that with the exception of two patients (#4 and our case 1), the patients survived more than one year; our case 2 survived 40 months and case 3 survived 20 months following resection of omental metastasis. Therefore, surgical intervention for solitary omental metastasis from NSCLC should be considered if no other metastasis is detected. Chemotherapy following resection of omental metastasis may be required, since long-time survivors (our case 2 and 3) continued postoperative chemotherapy.

In conclusion, although omental metastasis from NSCLC is extremely rare, it should be considered when a patient with history of NSCLC, particularly if the histology is pleomorphic carcinoma, has a solitary tumor around the stomach. Surgical resection for solitary omental metastasis from NSCLC may be indicated if no other metastasis is detected.

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