

Resection for Pancreatic Cancer Lung Metastases

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Background: Pancreatic cancer is a highly aggressive solid tumor. Patients with metastases from pancreatic cancer have poor survival rates. Here, we report the outcomes of 6 patients for whom resection of lung metastases was performed after a pancreatectomy to treat pancreatic cancer. **Methods:** We retrospectively reviewed the perioperative clinical data of patients with lung metastases resulting from primary pancreatic cancer who were treated with lung resection between 2008 and 2015. We report 6 cases where lung resection was performed to treat lung metastases after a pancreatectomy. **Results:** The number of lung metastases was 1 in 5 cases and 2 in 1 case. The surgical procedures performed to treat the lung metastases included 4 wedge resections and 2 lobectomies. The cell type of the primary tumor and metastases was tubular adenocarcinoma in 5 cases and intraductal papillary-mucinous carcinoma in 1 case. All 6 patients survived with a mean follow-up period of 65.6 months, although the disease recurred in 2 patients. **Conclusion:** Resection of lung metastases resulting from primary pancreatic cancer may lengthen survival, provided the patient can tolerate surgery.

Key words: 1. Lung
2. Metastasis
3. Pancreatic neoplasms

Introduction

Pancreatic cancer remains a very lethal disease: the median survival period for all patients who undergo pancreatic resection is 12.6 months [1]. The majority of the survivors will die from a recurrence of the disease, as the 3-year disease-specific survival rate is only 27% [2]. Pancreatic cancer rarely leads to a solitary lung metastasis; usually, it leads to multiple metastases. The efficacy of lung resection to treat pancreatic cancer metastases remains unknown because there are few extended case reports of this treatment.

Methods

Ten patients with lung metastases resulting from primary pancreatic cancer were treated with lung resection at Tokyo Metropolitan Komagome Hospital between 2008 and 2015. Of these patients, 6 underwent lung resection after a pancreatectomy was performed. Informed consent was obtained from all patients, and the study was approved by the institutional review board of Tokyo Metropolitan Komagome Hospital (IRB number: 1800).

Overall survival time was defined as the interval between the date of pancreatic surgery and the date of death resulting from any cause or the date that the patient was last reported to be alive. Relapse-free

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Table 1. Baseline characteristics

Case	Sex	Age (yr)	Operation method to treat pancreatic cancer	Histology	Stage	Adjuvant chemotherapy
1	M	64	DP	Tubular adenocarcinoma	IB	GEM
2	M	65	PD	Tubular adenocarcinoma	IIA	GEM
3	F	64	DP	Tubular adenocarcinoma	IV	S-1
4	F	63	PPPD	Tubular adenocarcinoma	IIA	GEM
5	M	65	PD	Tubular adenocarcinoma	Unknown	S-1
6	F	74	DP	Intraductal papillary-mucinous carcinoma	IV	GEM

DP, distal pancreatectomy; GEM, gemcitabine; PD, pancreatoduodenectomy; PPPD, pylorus-preserving pancreatoduodenectomy.

Table 2. Clinical outcomes

Case	Relapse-free survival (mo)	No. of lung metastases	Operation method of lung metastases	Tumor size (cm)	Survival after lung resection (mo)	Overall survival (mo)
1	64.0	1	Wedge resection	0.7	47.7	114.6
2	25.1	2	Lobectomy	1.6, 0.4	46.9	91.7
3	26.0	1	Wedge resection	2.8	38.3	65.4
4	19.7	1	Wedge resection	1	36.2	77.6
5	54.1	1	Lobectomy	4	31.1	85.9
6	0.0	1	Wedge resection	2.1	26.1	60.3

survival time was defined as the interval between the date of pancreatic surgery and the date of recurrence.

Results

Table 1 summarizes the baseline characteristics of these 6 patients. The study group consisted of 3 men and 3 women with a median age of 64.5 years (range, 63 to 74 years). The cell type of the primary tumor and metastases was tubular adenocarcinoma in 5 cases and intraductal papillary-mucinous carcinoma in 1 case. All patients received adjuvant chemotherapy with either gemcitabine (GEM) or S-1. The number of lung metastases was 1 in 5 cases and 2 in 1 case. The median relapse-free survival time was 25.6 months (range, 0 to 54.1 months), the median follow-up period after lung resection was 37.3 months (range, 26.1 to 47.7 months), and the median follow-up time was 81.7 months (range, 60.3 to 114.6 months) (Table 2).

The surgical procedures performed for lung metastases included 4 wedge resections and 2 lobectomies. All patients, except for patients 3 and 6, underwent definitive surgery. Patient 3 had stage IV disease, with peritoneal dissemination and lung metastases.

She was treated with a GEM/S-1 regimen and had a complete radiologic response. Patient 3 underwent a distal pancreatectomy 44 months after chemotherapy. She presented with a lung nodule 26 months after the initial resection and then underwent lung resection. The nodule subsequently was histologically diagnosed as a pancreatic cancer metastasis. Patient 6 had presented with a lung nodule and underwent a pancreatectomy and adjuvant chemotherapy at another institution. However, because the size of the lung nodule did not change, the patient was referred to our institution to undergo lung resection, which was performed 34 months after the initial resection. The nodule was histologically diagnosed as a lung metastasis resulting from pancreatic cancer. The disease recurred after lung resection in patients 3 and 6. Patient 3 relapsed with bilateral lung metastases 14 months after having undergone lung resection to treat the pancreatic cancer. After a partial resection of both lungs was performed, patient 3 was relapse-free at 5 months after surgery. Patient 6 relapsed with mediastinal lymph-node metastases 5 months after lung resection. The pathological stage of pancreatic cancer in patient 5 was unknown because this patient underwent resection at another hospital.

Discussion

Resecting lung metastases resulting from pancreatic cancer is rare. Only a few cases of long-term survival after such a procedure have been reported. A follow-up study involving resection of solitary pulmonary metastases showed that the median cumulative survival was significantly improved in the group that was treated with pulmonary resection [3].

The relatively long interval between the initial resection to treat the pancreatic cancer and lung metastasis, as well as whether the metastatic lung tumor is solitary and stable over time, must be considered before performing lung resection. The procedure should only be performed if the following conditions are met: (1) the patient can tolerate surgery; (2) the primary lesion is controlled; (3) no additional metastases are present outside of the lung; and (4) multiple lung metastases can be resected. In the present study, the 6 patients represent a unique and highly select group: the mean follow-up period was 81.7 months, the mean period between the initial pancreatic cancer resection and lung resection was 25.6 months, the mean follow-up period after lung resection was 37.3 months, and all of the patients remained alive for the duration of the follow-up period, although the disease recurred in 2 cases.

The 4 patients who developed lung metastases after the pancreatectomy did not experience recurrence after resection of the lung metastases. These results are consistent with earlier studies showing that patients in whom the first site of recurrence of pancreatic cancer was the lung had better survival rates than those who developed pulmonary metastases as a second or synchronous site of recurrence [4]. However, it has also been reported that patients with a first recurrence in the lung and at least 1 additional recurrent site had prognoses similar to those of patients in whom only the lung was the site of the first recurrence [5]. We can expect satisfactory long-term survival rates following lung resection if patients meet the above criteria, even in patients with stage IV disease who develop lung metastases prior to pancreatectomy. Similar to other reports, we conclude that when stable over time, lung metastases can be resected, and that a long interval between the initial resection to treat the pancreatic cancer and lung resection is related to long-term survival [6-8].

Thus, if patients meet these criteria, lung resection should be considered.

Occasionally, late and metachronous recurrence of lung metastases can occur, and may mimic primary lung carcinoma, making it difficult to differentiate primary lung cancer from a lung metastasis [8]. In such cases, lung resection should be considered.

In conclusion, herein, we describe patients who survived for a long period after undergoing a pancreatectomy to treat pancreatic cancer and subsequent resection of lung metastases. We conclude that resection of lung metastases resulting from primary pancreatic cancer may lengthen survival time, provided the patient can tolerate the operation.

Conflict of interest

No potential conflicts of interest relevant to this article are reported.

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