A Case of Long-term Survival after Surgical Resection of Solitary Pulmonary Metastasis from Gastric Cancer

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We describe a 60-year-old male patient who survived for a long period after pulmonary metastasectomy for gastric cancer. The patient initially underwent distal gastrectomy for gastric cancer. Seventeen months after the gastrectomy, surgical resection of solitary pulmonary metastasis was performed and following resection, the patient has survived without relapse for more than 5 years. Carefully selected patients have a good chance of benefiting from pulmonary metastasectomy for gastric cancer.

Key words: solitary pulmonary metastasis – pulmonary metastasectomy – gastric cancer

INTRODUCTION

The majority of pulmonary metastasis after curative resection for gastric cancer present as carcinomatous lymphangitis or carcinomatous pleuritis, with few cases considered operable.

We describe here a case of long-term survival after surgical resection of solitary pulmonary metastasis from gastric cancer.

CASE REPORT

A 60-year-old male was diagnosed with clinical stage IIIB gastric cancer (cT3N2M0). His medical history indicated appendicitis at 20 years of age and diabetes mellitus at 60 years. His father also had gastric cancer. From the time of diagnosis of gastric cancer, he stopped smoking after a 90-pack-year smoking history. He underwent distal gastrectomy with D2 lymphadenectomy and Roux-en-Y anastomosis at our institution. Gross examination of the resected specimen revealed a type 2 tumor (58 × 51 mm) arising from the greater curvature of the middle to the lower body of the stomach (Fig. 1). Microscopic examination revealed a well-differentiated adenocarcinoma with lymphatic but no venous invasion. The tumor had invaded the serosa but not the serosal surface. The proximal, distal and radial margins of the stomach were tumor-free. Regional lymph node metastases were found in 7 of 44 dissected lymph nodes (N1), arriving at a diagnosis of stage IIIA gastric cancer (pT3N1M0). The levels of the carcinoembryonic antigen (CEA) and carbohydrate antigen (CA) 19-9 were elevated to 13.3 ng/ml and 1504 U/ml, respectively, before surgery and returned to the normal level after surgery. Post-operative adjuvant chemotherapy was not administered (Fig. 1).

Computed tomography (CT) of the thoracic area on a follow-up visit 12 months after surgery revealed a 17 mm nodule in the left upper pulmonary lobe (S1+) with a regular margin, located adjacent to the pleura, and without any significant hilar or mediastinal lymphadenopathy. The CEA level was 5.0 ng/ml, which was within the normal range, but the CA19-9 level was elevated to 391 U/ml, respectively, before surgery and returned to the normal level after surgery. Post-operative adjuvant chemotherapy was not administered (Fig. 1).

Three months after the first detection of the pulmonary nodule, the patient underwent transbronchial lung biopsy but the procedure failed to yield a definite diagnosis. At this point, it was difficult to distinguish gastric cancer pulmonary metastasis from primary lung cancer based on imaging.
The patient had no evidence of extrapulmonary metastases and was advised to undergo thoracic surgery. He was admitted to our institution 1 month later for pulmonary resection.

On examination, the patient showed no symptoms of disease and his vital signs were normal. Clinical examination showed mild anemia with a hemoglobin level of 10.7 g/dl. His complete blood cell count, serum chemistry and pulmonary function test were normal. Chest X-ray revealed an oval 29 mm tumor nodule in the peripheral zone of the left upper lung field (Fig. 2). CT of the thoracic area identified a well-circumscribed 25 × 18 mm nodule in the left upper pulmonary lobe (S₁₂) widely adjacent to the pleura (Fig. 3). Non-specific pleural thickening was observed, but no hilar, mediastinal lymphadenopathic, or other changes were evident.

Thoracoscopy revealed adhesion between the left upper pulmonary lobe and the chest wall, but failed to identify the tumor. No pleural dissemination or effusion was detected. The patient underwent anterolateral thoracotomy through the 4th intercostal space. After dissecting the adhesion between the left upper pulmonary lobe and the chest wall, a hard tumor was identified. The tumor adhered strongly to the chest wall, suggesting possible chest wall invasion. Wedge resection of the tumor including the involved parietal pleura was performed. Intraoperative diagnosis was consistent with metastasis from gastric cancer.

Gross examination of the lesion demonstrated a 30 × 21 × 17 mm, elastic hard, yellowish white, smooth tumor with necrosis and scar (Fig. 4). Histopathological examination demonstrated morphological findings similar to those of the previously resected gastric cancer. The tumor was composed of tubular and partially papillary adenocarcinoma.

**Figure 1.** Gastrectomy specimen showing a 58 × 51 mm type 2 tumor in the greater curvature of the middle to the lower body of the stomach.

**Figure 2.** Chest X-ray image obtained 17 months after gastrectomy showing a nodule (29 mm) in the left upper lung field.

**Figure 3.** Chest CT performed 17 months after gastrectomy showing a nodule (25 × 18 mm) adjacent to thoracic wall in the left upper pulmonary lobe.

**Figure 4.** Wedge resected lung specimen showing a 30 × 21 × 17 mm elastic hard, yellowish white, smooth tumor.
with collagen fibers, compatible with gastric cancer metatases (Figs 5 and 6). Although the chest wall margin was tumor-free, the tumor had invaded the parietal pleura. Immunohistochemical staining showed negative for thyroid transcription factor-1 and Napsin A, suggesting the tumor was unlikely to be a primary lung adenocarcinoma. In light of the morphological similarity, we diagnosed the pulmonary tumor as a metastasis from gastric cancer.

On post-operative day 3, the patient developed surgical site infection and pyothorax, but recovered with surgical wound opening and thoracic drainage in 1 week. Four weeks later, the CEA and CA19-9 levels returned to the normal levels of 2.8 ng/ml and 32 U/ml, respectively. Follow-up examinations showed no evidence of recurrence 82 months after the initial gastrectomy and 65 months after the pulmonary resection.

**DISCUSSION**

Systematic circulation normally returns back to the lungs. Malignant tumors of organs supplied by the systematic circulation spread to the lungs intravascularly with high frequency. Pulmonary metastasis can thus be considered as a systematic disease in which tumor cells spread to the whole body, resulting in poor prognosis. However, long-term survival after surgical resection of pulmonary metastasis has been reported. According to the concept of the Cascade spreading process (1), some cases of pulmonary metastasis may be at the presystemic stage (i.e. tumor spread is still limited to the lungs which serve as an initial filter for trapping tumor cells) and can therefore benefit from surgical metastasectomy (2,3).

Pulmonary metastasectomy is considered when Thomford’s criteria (4) are met as follows: (i) the patient must be a good risk for surgical intervention, (ii) the primary site is controlled, (iii) no other extrapulmonary metastases exist, or if present, it can be controlled by surgery or another treatment modality and (iv) pulmonary metastases are thought to be completely resectable. Importantly, the effectiveness of surgical resection differs largely by tumor characteristics, development pathway and sensitivity to chemotherapy and radiotherapy. Therefore, understanding the nature of each malignancy and proper selection of patients for surgery are required.

Pulmonary metastasectomy reportedly improves survival among patients with pulmonary metastasis from colorectal cancer, particularly those with a 5-year survival rate to higher than 35–50% and those with a 10-year survival rate by 20–30% (5–7). For patients who fulfill the indication criteria, surgical procedure should be considered. On the other hand, metastasectomy in poor prognostic patients with pulmonary metastasis from esophageal cancer, gastric cancer, hepatocellular carcinoma, biliary tract cancer and pancreatic cancer is rarely indicated (2). The majority of pulmonary metastasis from gastric cancer present as carcinomatous lymphangitis or carcinomatous pleuritis. A solitary lesion is rare and usually occurs in multiple forms if present, together with liver metastasis or peritoneal dissemination. Few of such cases are indicated for surgical resection.

The incidence of pulmonary metastasis from gastric cancer based on autopsy cases has been reported to be 22.4–52.3% (8–10). Surgically resectable solitary pulmonary metastasis accounts for a very low 0.1% in patients who have undergone curative resection for gastric cancer (11). Several reports have described pulmonary resection of metastasis from gastric cancer (11–18). Some reports showed that the primary site of solitary pulmonary metastasis tends to present more with a type 3 tumor than with a type 2 tumor, that the tumor appears from the upper site with esophageal invasion and that the tumor is a microscopically well- to moderately differentiated adenocarcinoma (15,19,20). All these reports showed tumor characteristics in a small number of cases and thus analysis of prognostic
Table 1. Characteristics of cases of primary gastric cancer

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Type of gastrectomy</th>
<th>Depth of invasion</th>
<th>Pathological stage</th>
<th>Disease-free interval (months)</th>
<th>Outcome after pulmonary resection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>61</td>
<td>Distal</td>
<td>se (T3)</td>
<td>IIIA</td>
<td>17</td>
<td>Alive at 65 months</td>
</tr>
<tr>
<td>2</td>
<td>64</td>
<td>Total</td>
<td>se (T3)</td>
<td>III</td>
<td>120</td>
<td>Died at 35 months</td>
</tr>
<tr>
<td>3</td>
<td>73</td>
<td>Total</td>
<td>Unknown</td>
<td>Unknown</td>
<td>37</td>
<td>Died at 123 months</td>
</tr>
<tr>
<td>4</td>
<td>61</td>
<td>Total</td>
<td>ss (T2)</td>
<td>II</td>
<td>59</td>
<td>Died at 13 months</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
<td>Distal</td>
<td>ss (T2)</td>
<td>IB</td>
<td>46</td>
<td>Died at 27 months</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
<td>Distal</td>
<td>ss (T2)</td>
<td>II</td>
<td>20</td>
<td>Died at 5 months</td>
</tr>
</tbody>
</table>

*Present case.

factors is not possible. Pulmonary metastasectomy remains controversial considering the small number of cases that had fulfilled the surgical indication criteria but failed to show survival improvement by resection of solitary pulmonary metastasis (2,11,12). However, several cases with long-term survival after surgical resection of pulmonary metastasis from gastric cancer similar to the present case have been reported, indicating that appropriately selected patients may benefit from surgical resection (14–18).

Six cases including the present case presenting with solitary pulmonary metastasis from gastric cancer underwent pulmonary metastasectomy between 1997 and 2006 at our institution (Table 1). The median interval time between gastrectomy and the first detection of pulmonary metastasis was 29.5 months (13–115 months). Two cases whose lesion was difficult to distinguish from primary lung cancer underwent lobectomy, and the remaining four underwent partial resection. Two cases who received S-1 monotherapy as adjuvant chemotherapy after pulmonary resection relapsed with liver and pulmonary metastases, but the other four showed no evidence of relapse. The median follow-up time after the resection of pulmonary metastasis was 31 months (5–123 months). The 5-year survival rate after the resection of pulmonary metastasis was 33.3%. The median survival time for unresectable or recurrent gastric cancer was 7–10 months. Cases with solitary pulmonary lesions who will tolerate pulmonary resection and have prospects of a good post-operative quality of life and whose pulmonary lesions are thought to be completely resectable without any evidence of extrapulmonary metastasis have a good chance of improved survival, similar to the present case, and thus surgical procedure should be considered.

CONCLUSION

We described a case of long-term survival after surgical resection of solitary pulmonary metastasis from gastric cancer. Although few cases can fulfill the indication criteria for pulmonary metastasectomy, selected patients have a good chance of benefiting from surgical resection. When a solitary pulmonary lesion is detected after surgical resection of gastric cancer, the same procedure should also be considered for the histologic differentiation of the metastasis from primary lung cancer.

Conflict of interest statement

None declared.

References


