Surgical Management of Primary Lung Cancer in an Elderly Patient with Preoperative Empyema

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A 74-year-old man with primary lung cancer developed preoperative empyema but was successfully managed surgically. The patient was given a diagnosis of c-T2N1M0, stage IIB, moderately differentiated squamous cell carcinoma, but before surgery pneumothorax and empyema developed, resulting from rupture of the carcinoma. Thoracic drainage, lavage and systemic administration of antibiotics improved his empyema. As there were no malignant cells in the drainage fluid, right middle-lower bilobectomy, empyema cavity resection and lymph node dissection were performed. The bronchial stump was covered with an intercostal muscle flap. Thoracic drainage, lavage and systemic administration of antibiotics were performed for 6 days following the operation. The patient was discharged on the 27th postoperative day without any complications having developed. The pathological diagnosis of the tumor was p-T4N2(#7)M0, stage IIIb, br(−), ly(+), v(+), p3(pleura), pm1 and d0. He died of recurrence at home 18 months after the operation. We believe the following to be the minimum requirements for surgical management of such patients: (1) immediate thoracic cavity drainage and lavage with systemic antibiotic therapy, aiming at infection control before surgery; (2) prophylactic lavage of the thoracic cavity during and after surgery and (3) coverage of the bronchial stump with an adequate flap. Six reported cases of primary lung cancer with preoperative empyema are also discussed.

Key words: primary lung cancer--preoperative empyema--surgical resection--stump coverage--lavage

INTRODUCTION

Empyema is not a common complication in primary lung cancer patients, yet the surgical management of the condition has rarely been reported in the literature. We describe an elderly patient with primary lung cancer in whom preoperative empyema developed and in whom surgical management was successful.

In this paper, the staging is based on the UICC criteria (1) and we use the terminology proposed by the Japan Lung Cancer Society (2) and Naruke et al. (3,4).

CASE REPORT

A 74-year-old man had been suffering from productive cough since September 1995. An abnormal shadow in the right lung was detected on an annual chest X-ray in October and he was referred to our institute on December 4. Chest X-ray and computed tomography (CT) showed a tumor mass of 5.0 x 3.0 cm in size in the right lower lung field (Fig. 1). Transbronchial lung biopsy (TBLB) on December 11 revealed moderately differentiated squamous cell carcinoma. Detailed examinations resulted in a diagnosis of c-T2N1M0, stage IIB disease. While waiting for surgery, the patient developed a right chest pain on January 6, 1996. On January 8, he was admitted to our hospital because of a high fever. Chest X-ray film taken on emergency admission showed inflammatory findings in the right lower lung field. A cavity had formed in the tumor.

On admission, he was 156 cm in height and weighed 52.8 kg. Blood pressure was 132/80 mmHg; pulse rate, 106/min; body temperature, 38.2°C; and SaO₂, 94%. Superficial lymph nodes were not palpable. He had been smoking 40 cigarettes per day between the ages of 30 and 72 years. Breath sounds were weak in the right lower lung field and sputum was yellow.

Intravenous injection of 2 g of piperacillin (PPC) twice daily was commenced immediately after admission. The patient had a moderate fever from January 8 to 10, which
Preoperative empyema

Figure 1. CT depicted a tumor of a relatively low density in the right latero-basal segment (S9) adjacent to the pleura, with a swollen interlobar node.

Figure 2. Chest CT revealed a rupture in the tumor wall.

Figure 3. The size of the empyema reduced, 14 days after thoracic drainage.

broke a spiking fever on January 11. Pleural effusion with a niveau formation was noticed on chest X-ray on January 16. Based on the CT findings (Fig. 2), we diagnosed pneumothorax and empyema resulting from rupture of the carcinoma. Placement of a 24 Fr. double-lumen trocar catheter immediately drained 250 ml of turbid yellow effusion. Cytological examination revealed no malignant cells. Pleural effusion cultures revealed alpha-Streptococcus and Prevotella ruminicola. The thoracic cavity was lavaged daily with 1000 ml of 5% povidone iodine saline. The fever and productive cough subsided, along with a gradual decrease in CRP. Chest CT showed a reduction in the empyema cavity size 14 days after the drainage started (Fig. 3). The treatment resulted in improvement of his empyema, general condition and nutritional state.

Surgical resection was performed on February 14, 28 days after the thoracic drainage. Thoracotomy was performed through a posterolateral incision in the fifth intercostal space and we prepared a pedicled fifth intercostal muscle flap. Severe inflammatory adhesion was noted in the right thoracic cavity. No pleural effusion or dissemination was found. A hard tumor 4 cm in diameter was located in the latero-basal segment (S9) region and appeared to have a rupture orifice on the visceral pleura. The interlobar, hilar and subcarinal nodes were swollen. Resection of the right middle and lower lobes together with the empyema lesion, including a part of the parietal pleura and lymph node dissection up to the subcarinal nodes, was performed (R1+\#7). As the upper mediastinal lymph nodes did not show significant enlargement or hardness, they were not dissected. The bronchial stump was covered with the intercostal muscular flap to prevent postoperative bronchial fistula. Two 28 Fr. double-lumen trocar catheters were inserted, one in the ventral thoracic cavity to the apex and the other in the dorsal thoracic cavity to the base. Intraoperative findings were S-T2N2(\#7)M0, stage IIIA lung cancer.
Prophylactic administration of 2 g of PIPC was given twice daily and the thoracic cavity was lavaged twice daily with 1000 ml of 5% povidone iodine saline for 6 days following the operation. His fever was in the region of 38°C for 2 days after surgery, but it subsided on the sixth postoperative day. The two drainage catheters placed in the ventral thoracic cavity to the apex and in the dorsal thoracic cavity to the base were removed on the third and seventh postoperative day, respectively. No malignant cells were detected in the drainage fluid. The patient was discharged on March 12 (27th POD) without complications.

Macroscopically, the resected tumor was pale yellow and solid, consisting of fragile tissue with a cavity formation (Fig. 4). Histopathologically the tumor was diagnosed as moderately differentiated squamous cell carcinoma (Fig. 5A). Part of the tumor was exposed in the empyema cavity (Fig. 5B). A pulmonary metastasis was found immediately beneath the superior segmental (S6) pleura. The pathological stage of the tumor was p-T4N2M0, stage IIIB, br(-), ly(+), v(+), p3(pleura), pm1 and d0. Nodal metastasis was proven in the subcarinal node (#7).

He developed bloody sputum and fever in January 1997, 11 months after the operation. Chest CT on February 5 showed a swollen hilar lymph node (#10). The right upper lobe bronchus was almost obstructed by the node. Radiotherapy (48 Gy) was performed from February 14. Bloody sputum reduced, but the swollen node showed no change in size. He was given palliative care on an outpatient basis but he died of the disease on July 10 at home, 18 months after the operation.

DISCUSSION

The reported incidence of empyema associated with primary lung cancer is very low, ranging from 0.1 to 0.3% (5,6), and few such case are operable, with only six cases having been reported in Japan (Table 1) (5,7–11). The male to female ratio of the patients was 5:1. Their ages ranged from 53 to 72 years and our case was the oldest. To the best of our knowledge, no case has been reported in the literature outside Japan. The low incidence has been explained by the malignant nature of the disease that rarely allows the patient to survive until pleural involvement and tumor rupture occur (12). Empyema cases
also might have remained unreported because their development could be regarded as a natural consequence of the disease.

All the reported patients who underwent surgical resection were acute empyema cases. The suspected causes of empyema in previous reports were classified into three groups: (1) no specific causes, but possibly attributable to obstructive pneumonia that progressed to pulmonary abscess and consequent empyema (one patient) (9); (2) marked tissue necrosis induced by effective chemotherapy, radiotherapy or bronchial artery infusion treatment, leading to empyema (three patients) (7,8,10); and (3) empyema induced by TBLB (two patients) (5,11). Our case was not treated before the onset of empyema, excluding the second cause. The time period between the TBLB and the onset of fever was long, 26 days. In addition, histopathological examination did not reveal signs of destruction by biopsy instruments, which would therefore exclude the third cause. The empyema may have developed without any specific causes.

Acute empyema was managed mainly by a combination of thoracic drainage and antibiotic therapy (13). When the general condition improved, elective surgery was performed. This strategy was based on the fact that surgical resection during severe thoracic infection carries too high a risk of complications. We also started thoracic drainage and lavage along with systemic antibiotic therapy immediately after the development of empyema and succeeded in reducing the CRP level and eradicating the infection.

On the other hand, there has been a report of favorable results following surgery performed before the infection control. Koike et al. (5) listed the following rationale for their early surgical intervention: (1) thoracic wall invasion and/or pleural dissemination might occur following the tumor rupture; (2) a malignant tumor should be resected as early as possible; (3) some cases might become unresectable if empyema proceeded to the chronic stage and peels were formed. However, they also concluded that it was reasonable to perform surgery after the general condition of the patient improved and the thoracic cavity was cleaned by drainage and lavage, preferably 7-10 days after the onset of empyema.

The time period between drainage and surgery ranged from 0 to 39 days in the reported cases. Adequate preoperative control of inflammation was achieved in two patients, requiring 7 and 21 days, respectively. In the other four patients, surgery was performed before the thoracic infection was eradicated.

Prophylactic measures against bronchial fistula and postoperative empyema were performed in most cases. These included bronchial stump coverage with tissue flaps (14), thoracic cavity lavage after surgery and antibiotic therapy (15). Stump coverage was performed in three of the reported six patients (10-12). Postoperative lavage of the thoracic cavity was carried out in three patients.

The flap grafts reported in the literature included omentum (16), intercostal muscle (17), pectoralis major muscle, serratus anterior muscle (18,19), pericardial fat, thymus and adipose tissue surrounding the thymus (14). We employed a muscular flap of the fifth intercostal muscle because of its easy availability. Rendina et al. (17) used the intercostal pedicle flaps in 59 patients and reported that postoperative angiographic study of the intercostal artery in 14 patients demonstrated full patency of the vessel. Yamamoto et al. (9,10) employed intercostal muscular flaps in 67 patients undergoing surgical resection of lung cancer and only one postoperative bronchial fistula developed in a patient with concurrent empyema. However, favorable results were obtained in the reported two cases of empyema managed with an intercostal muscular flap. Besides, the present case was regarded as opportunistic based on the general status and his age. We believe that the intercostal muscular flap was an appropriate choice for stump coverage in our case.

Table 1. Surgically managed primary lung cancer with empyema reported in the literature

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Age, gender</th>
<th>Histology</th>
<th>TNM stage*</th>
<th>Emphyema cause</th>
<th>Operation</th>
<th>Days between surgery and (drainage)</th>
<th>Lavage (days after surgery)</th>
<th>Preoperative general control</th>
<th>Coverage of bronchial stump</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>55M</td>
<td>LCC</td>
<td>c-T2N2M0, IIA</td>
<td>BAI</td>
<td>RULML</td>
<td>0 (NDs)</td>
<td>6</td>
<td>Fever, dyspnea</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>72F</td>
<td>SCC</td>
<td>c-T4N3M0, IIB</td>
<td>CTx</td>
<td>Subsophagectomy</td>
<td>23 (21)</td>
<td>90</td>
<td>Good</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>66M</td>
<td>Sq</td>
<td>ND</td>
<td>Not specified</td>
<td>RP</td>
<td>ND (NDs)</td>
<td>ND</td>
<td>Air leakage</td>
<td>+ (omentum)</td>
</tr>
<tr>
<td>6</td>
<td>53M</td>
<td>Sq</td>
<td>c-T2N2M0, IIA</td>
<td>BFS</td>
<td>RLL</td>
<td>53 (39)</td>
<td>4</td>
<td>Fever</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>61M</td>
<td>Sq</td>
<td>T2N2M0, IIA</td>
<td>CRTx</td>
<td>RP</td>
<td>4 (2)</td>
<td>ND</td>
<td>Air leakage, dyspnea +</td>
<td>(intercostal muscle)</td>
</tr>
<tr>
<td>12</td>
<td>66M</td>
<td>Sq</td>
<td>p-T2N0M0, IBr</td>
<td>BFS</td>
<td>LP</td>
<td>7 (7)</td>
<td>0</td>
<td>Good</td>
<td>+ (intercostal muscle)</td>
</tr>
<tr>
<td>This work</td>
<td>74M</td>
<td>Sq</td>
<td>p-T4N2M0, IIIB</td>
<td>26 days after TBLB</td>
<td>RMLLL</td>
<td>34 (28)</td>
<td>5</td>
<td>Good</td>
<td>+ (intercostal muscle)</td>
</tr>
</tbody>
</table>

LCC, large cell carcinoma; SCC, small cell carcinoma; Sq, squamous cell carcinoma; BAI, bronchial artery infusion; CTx, chemotherapy; CRTx, chemoradiation; BFS, bronchofiberscope; RULML, right upper-middle bilobectomy; RP, right pneumonectomy; RLL, right lower lobectomy; LP, left pneumonectomy; RMLL, right middle-lower bilobectomy; NDs, not drained; ND, not described. *The staging is based on UICC criteria, 1997 (1).
Dissemination of cancer cells may occur as a natural consequence of tumor rupture. Therefore, surgical indications must be carefully considered, especially in elderly patients. From the quality-of-life standpoint, the operation was of value for our patient, because it enabled him to be at home free from thoracic drainage. However, as he died of the disease 1.5 years after the operation, we should be aware of possible dissemination and that surgery for empyema attributable to tumor rupture is a palliative therapy. The balance between expected benefits and possible risks of surgical intervention is also important. In the current case, we did not perform systematic nodal dissection of the upper mediastinum, because no metastasis to the nodes was suspected. We did not perform omentum grafting in order to avoid excessive surgical stress.

As there are only a limited number of reports in the literature, we could not conclude definitely what the optimum management of lung cancer with empyema would be.

CONCLUSIONS

The most feasible management appears to be a combination of various methods reported to have provided favorable results, depending on the individual state of the patient. We believe the following to be the minimum requirements for management of such patients: (1) immediate thoracic cavity drainage and lavage with systemic antibiotic therapy, aiming at infection control before surgery; (2) prophylactic lavage of the thoracic cavity during and after surgery; and (3) coverage of the bronchial stump with an adequate flap. Although dissemination is anticipated and the patient is at a high risk under such conditions, surgical intervention can contribute to the improvement of quality of life in selected patients.

Acknowledgment

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References


