Rapid-growth Lung Cancer Associated with a Pulmonary Giant Bulla: A Case Report

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Summary: A giant bulla of the lung is suggested as a risk factor for lung cancer. Here we report a case with lung cancer in a giant bulla, which showed rapid progression. A 57-year-old man, who had a history of heavy smoking, was admitted to our hospital due to hemoptysis. A chest X-ray revealed a giant bulla with a ground glass shadow and a high fluid level in the right upper lung. Sputum cytology was negative for malignant cells. A chest X-ray a month later showed increases of the size of the radio-opaque shadow and of the air-fluid retention, suggesting pulmonary hemorrhage from the giant bulla. Limited resection or lobectomy was indicated, but pneumonectomy was performed due to the severe air-leak. Macroscopically, a multiple nodular tumor arose from the bulla wall, which might be related to blood flow and necrotic tissue. The postoperative pathological diagnosis was papillary adenocarcinoma. Unfortunately, the patient developed a recurrence of carcinoma in the pleuroperitoneal cavity and died at 2.5 months after the operation.

Based on this report and review of other cases in the literature, we should keep in mind the rapid progression of lung cancer in association with an emphysematous bulla.

Key words giant bulla, lung cancer

INTRODUCTION

The incidence of lung cancer in bullous disease occurs with significant frequency among the general population, and its prognosis is frequently poor. Stoloff et al. [1] reported that the frequency of lung cancer in subjects with bullous disease was approximately 32 times higher than in those without this abnormality. In this report, we describe a patient with lung cancer associated with a giant bulla, who presented a progressive course after the operation.

CASE REPORT

A 57-year-old Japanese man, presented hemoptysis on 11 April, 2002. A chest X-ray showed a giant bulla accompanied with a ground glass shadow and fluid retention in the right upper lung (Fig. 1). Sputum cytology was negative for malignant cells. Hemoptysis continued for the next month, and a chest X-ray a month later showed increases of the area of radio-opaque lung and of the air-fluid retention (Fig. 2), which suggested pulmonary hemorrhage from the giant bulla. The patient was admitted to our hospital for further examination and treatment on 8 May, 2002. The patient had a history of heavy smoking (Brinkmann Index 1110), and the past history included pneumonia and pneumothorax in the right lung. On admission, the patient suffered hemoptysis, chest pain, and dyspnea. The circulatory and digestive systems had no abnormal signs, but a weak coarse crackle sound was heard over the right chest wall. A bronchofiberoptic examination and pulmonary function tests could not be performed. A chest computed tomography scan showed a ground glass shadow and fluid retention, with appearance of
a nodular shadow in the right upper lobe of the lung (Fig. 3). No other tumor was detected in the brain, liver, or bone. First, we attempted to stop the bleeding using the bronchial artery embolism, but a 4th intercostal artery angiographic examination showed a shunt from the intercostal artery to the superior pulmonary vein. Thus, it was impossible to perform the bronchial artery embolism. Therefore, the patient was transferred to the department of surgery for an emergency operation. Preoperative diagnosis was pulmonary hemorrhage from the giant bulla or malignant tumor, and thoracotomy was performed on 14 May, 2002. Limited resection or lobectomy was indicated, but right pneumonectomy was performed due to severe air-leak. Subsequently, regional lymph node dissection was performed. Macroscopically, the markedly emphysematous right upper and lower lobes contained several bullae varying in size. The yellowish multiple nodular tumor with a base of 9.5×6.0 cm arose from the giant bulla wall, which...
might be related to the blood flow patterns and necrotic tissues (Fig. 4). Microscopically, the tumor was a moderately differentiated papillary adenocarcinoma with extensive necrotic tissue (Fig. 5). The wall of the giant bulla was thickened by connective tissue proliferation, and carcinoma cells were found on the bulla wall. The parenchymal tissue around the bulla wall was emphysematous, and fibrous changes were detected. The hilar and mediastinal lymph nodes were negative for tumor cells. The patient developed a recurrence in the pleuroperitoneal cavity and died at 2.5 months after the operation due to cancer progression.

**DISCUSSION**

Lung cancer develops more frequent in cases with a bullous disease such as emphysematous giant bulla [2] or lung cyst [3]. Cases of a carcinoma arising in bullous lung disease have been reported during the past 40 years [2,4-8], and the incidence of lung cancer associated with bullous emphysema has been estimated to be 2-6% of the general population [8].

Goldstein et al. reported the frequency of a pulmonary bulla in patients with lung cancer. They demonstrated a giant bulla in 18 patients among 411 patients with primary lung cancer. The frequency of a giant bulla in cases with lung cancer was approximately 6 times higher than in those without lung cancer. The histological types were anaplastic cancer in 12, squamous cell carcinoma in 4, and adenocarcinoma in 2. All cases were male smokers in the age range of 40-59 years [2]. Stoloff et al. analyzed 75,000 chest X-rays and reported that cancer was found in 6.1% of patients with bullous disease, and in only 0.16% of patients without bullous disease. The frequency of lung cancer in cases with bullous disease was approximately 32 times higher than in those without bullous disease. They also included data from a retrospective study, and found 26 additional cases of lung cancer with bullous disease in the lung. The tumors were considered to have originated inside the bulla in 6 of these cases, and the bulla and tumors were separated by normal lung parenchyma in the remaining 20 cases [1].

Although the carcinogenesis of bullous disease remains uncertain, various etiologies have been proposed for the association between bullous disease and lung cancer. The wall of a bulla may undergo metaplastic transformation [9] or be related to scar [10]. Stagnation of carcinogens in the bulla may induce carcinogenesis [11] or inhibit antielastase enzymes, resulting in interalveolar-septal destruction with subsequent bulla formation [12].

The clinical features of lung cancer associated with giant bullous disease were reviewed in 67 reported patients with definitive histological diagnosis, including our patient. We found that the characteristics of a patient with lung cancer and coexistent giant bulla were: 1) most are male smokers of age over 50 years (average, 54.9), 2) main subjective symptoms are hemoptysis (27.2%), fever (23.4%), and asymptom (19.1%), 3) the histological types are various, adenocarcinoma (47.8%), large cell carcinoma (28.3%), and squamous cell carcinoma (20.9%), 4) no preoperative diagnosis (29.8%), and operatively or postoperatively definitive diagnosis (70.2%) and 5) rapid growth in the giant bulla, and poor prognosis. Our patient was a 57-year-old male smoker. A heavy smoking habit has been discussed as a cause of lung cancer in patients with a coexistent giant bulla. The hemoptysis due to pulmonary hemorrhage from the giant bulla was an unusual symptom. His lung cancer showing rapid growth from the giant bulla during one month was a special feature and difficult to diagnose preoperatively. Radiological diagnosis may be difficult when the tumor is small and appears as an excrescence on the wall of the bulla, especially in the case that an air-fluid level obscures the tumor. The histological diagnosis of lung cancer in this case was a moderately differentiated papillary adenocarcinoma, and the carcinoma cells were found on the bulla wall. The majority of lung cancers associated with bullous disease are non-small cell cancer, and there has been only one
report of bullous disease associated with small-cell lung cancer [7].

In conclusion, we should keep in mind the potential for rapid growth in lung cancer in a patient with a giant bulla. Regular follow-up must be conducted to detect any early small lung cancer in patients with a giant bulla in the lung.

REFERENCES