Multiple Pulmonary Metastases with Cavitation from Gallbladder Cancer

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We report a rare case of multiple pulmonary metastases with cavitation from gallbladder cancer. A 77-year-old woman was admitted to our hospital complaining of productive cough and exertional dyspnea. Chest X-ray film showed multiple nodular shadows with some cavitation. Computed tomography showed multiple cavities, up to 2 cm in diameter, as well as nodules, in bilateral lung fields. Under a survey of primary focus, the ultrasonographic test of the abdomen revealed a hypoechocic mass in the hepatic hilum. The patient died of respiratory failure. Autopsy findings revealed that that multiple lung tumors had metastasized from papillary adenocarcinoma of the gallbladder and that cavitation of the lung was formed by bronchioloectasis. (Internal Medicine 37: 292-294, 1998)

Key words: metastatic lung cancer, cavitary shadow, adenocarcinoma

Introduction

Cavitation in pulmonary metastases is thought to be rare (1). Primary carcinomas of the lung can cause pulmonary cavitation, as can pulmonary metastases of squamous cell carcinoma from the head, neck, and female genitalia (2). Pulmonary cavitation can also occur in metastatic adenocarcinoma of the colon and in metastatic sarcoma, although these are less common (3). Here, we report a rare case of multiple cavitating pulmonary metastases from adenocarcinoma of the gallbladder, and discuss possible mechanisms of cavity formation in this case.

Case Report

A 77-year-old Japanese woman came to our hospital because of productive cough and exertional dyspnea. Three months earlier coughing with whitish sputum had appeared. Although antibiotics and antitussive drugs had been given at an outpatient clinic, her symptoms persisted. Two weeks before admission she had noticed exertional dyspnea, which had gradually deteriorated. She was not a smoker and had never undergone surgery. The physical examination was negative except for hepatomegaly. A chest X-ray showed multiple nodular shadows with some cavitation throughout the lungs. Computed tomography showed multiple cavities with relatively thick wall, up to 2 cm in diameter, as well as solid nodules, in the bilateral lung fields (Fig. 1) and an enlarged pretracheal lymph node in the mediastinum. Laboratory examination disclosed liver dysfunction aspartate aminotransferase (AST) 122 mU/ml, alanine aminotransferase (ALT) 95 mU/ml and γ-glutamyltranspeptidase (γ-GTP) 116 mU/ml and high levels of carcinoembryonic antigen (10.8 ng/ml) and carbohydrate antigen 19-9 (2,445 U/ml) in serum. Cytology of the sputum was class V by Papanicolaou test. All the microbiologic tests were negative. Examination by computed tomography and ultrasonography of the abdomen showed a mass lesion, about 4 cm in diameter, in the hilum of the liver, mild dilatation of the intrahepatic bile ducts and swelling of paraaortic lymph nodes. The tumor involved the gallbladder, in which no stones could be detected.

Based upon the results of clinical examinations, metastatic lung tumors from cancer of the bile duct or gallbladder was suspected. However, because of her advanced age and poor general condition, bronchoscopic examination could not be performed and chemotherapy could not be given. The patient gradually worsened and three months after admission, she died of hypoxic respiratory failure. Autopsy findings revealed that a tumor, the histology of which was papillary adenocarcinoma, was located in the fundus of the gallbladder with extensive invasion to the parenchyma and hilus of the liver. Pathological diagnosis of lung tumors was well-differentiated papillary adenocarcinoma. Carcinoma cells showed papillary growth and many cavities up to 2 cm in diameter consisted of...
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Figure 1. Chest CT showing multiple cavities and nodules in the bilateral lung fields.

Figure 2. A) Microscopic findings of lung tumor showing papillary adenocarcinoma, bronchioalveolar type of growth, and bronchiolectasis (HE original magnification ×100). B) Microscopic findings of gallbladder tumor showing well-differentiated papillary adenocarcinoma (HE original magnification ×100).

bronchiolectasis (Fig. 2A). The pathological findings were identical to those of the gallbladder cancer (Fig. 2B). Therefore the diagnosis of multiple metastatic lung cancer from gallbladder cancer could be confirmed. There was no pathological evidence of infection such as tuberculosis or fungi, necrosis, thrombosis, cystic lesion and mucin secretion of tumor cells in the lung.

Discussion

Multiple cavitation of the lung can be caused by various diseases, such as lung cancer, pulmonary cystic disease, infection (especially tuberculosis and fungal infections), septic embolism, Wegener’s granulomatosis, malignant lymphoma, and other conditions. Although cavitation in primary lung tumors is well recognized, cavitation in pulmonary metastases is thought to be rare. Since Bristowe first described a case of cavitation in a pulmonary metastasis from pharyngeal cancer in 1871 (4), comparatively few cases of metastatic lung tumors with cavitation have been reported. Minor, in a series of 314 cases of cancer with lung metastases, found only four with evidence of cavitation (5). Dodd and Boyle, in a series of 574 cases of malignant tumors of the lung, reported that cavitation was encountered in only 4% of pulmonary metastases (6).

Cavitating pulmonary metastases are most often caused by primary squamous cell carcinoma of the larynx, pharynx, tongue, uterine cervix, and skin (7, 8). Although less common, cavitation can also occur in metastatic adenocarcinoma of the colon and rectum, breast, and pancreas. More rarely, sarcoma, testicular seminoma, and transitional cell carcinoma of the urinary bladder have been reported as primary lesions (2, 3). Gallbladder cancer substantially tends to metastasize to the lung and an incidence of 55% was found in cases of gallbladder cancer studied by autopsy (9, 10). However, our search of the English-language literature revealed no reports of cavitating pulmonary metastases from adenocarcinoma of the gallbladder (1–9).

At least six mechanisms have been proposed to explain cavity formation in metastatic pulmonary lesions: 1) central necrosis caused by inadequate blood supply and by infection as tumors grow (2), 2) ischemic necrosis due to thrombosis of arteries supplying the tumors (7), 3) central degeneration, especially in cases of keratin-producing squamous cell carcinomas (11), 4) the tendency of mucin-secreting adenocarcinomas to form cysts, particularly when the primary tumor is in the ovary, breast, or gastrointestinal tract (6), 5) formation of cystic air spaces resulting from an intermittent check-valve obstruction of a bronchiole (2), and 6) a thin layer of malignant cells growing into a pre-existing cavity or cyst (12). We presume that pulmonary cavitation can also occur by one or some combination of these factors.

The characteristic finding of the chest computed tomography (CT) in this case was multiple cavitary formation in the small nodules, which were distributed in the centrilobular pattern. Generally, the large tumors tend to form cavitation by central necrosis resulting from ischemia that develops as the
tumors outgrow their blood supply. Here, the small size makes it highly improbable that inadequate blood supply caused central necrosis. Also in the autopsy of this case, there was no evidence of necrosis and thrombosis in the metastatic foci. The small size and centrilobular distribution of cavities in the metastatic nodules were compatible to autopsy findings that the central cavities were composed of bronchioloectasis. We considered that the bronchioloectasis was caused by the disturbance of aeration into the alveoli due to tumor growth.

For another mechanism of cavitation showing the same pattern (size and distribution) as the present case, a check-valve mechanism could also be considered. During the early stages of its growth a tumor may obstruct a small bronchus, leading to air retention distal to the obstruction. In the present autopsy, however, a cystic change of air sacs suggestive of a check-valve mechanism could not be detected. Furthermore, the walls of the cavities in this case were not thin but thick roentgenographically. Therefore, such a mechanism could not be compatible in our case.

We reported a rare case of pulmonary cavitating metastases due to gallbladder cancer and noted that bronchioloectasis should be included in the important mechanisms forming cavitation.

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**References**