

## Biphasic Pulmonary Blastoma: Report of a Case

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**A 73-year-old male presented with bloody sputa for a month. Chest computed tomography (CT) showed a large mass about 7 cm in diameter in the right lower lobe. Bronchoscopic curette cytology revealed class V and a suspected adenocarcinoma, although a systemic evaluation demonstrated no metastatic lesion. The patient underwent a right lower lobectomy and mediastinal dissection. A biphasic pulmonary blastoma was histologically diagnosed by a characteristic finding that it was mainly constituted of immature tumor tissue that had both epithelial and mesenchymal components. No mediastinal lymph node metastasis was proven. Stage T2N0M0 disease was diagnosed, and the patient chose not to undergo postoperative adjuvant chemotherapy; he remains well without recurrence 36 months after the operation. (Ann Thorac Cardiovasc Surg 2007; 13: 40–3)**

**Key words:** lung cancer, neoplasm, pulmonary blastoma, surgery

### Introduction

Pulmonary blastoma is a rare lung neoplasm, 0.5% of all lung cancers, that histologically resembles fetal lung tissue. Biphasic pulmonary blastoma (BPB) is a subgroup of pulmonary blastoma and is characterized by a unique histological heterogeneity intermixing of both epithelial and mesenchymal malignancies. The tumor progresses rapidly and therefore the prognosis is very poor. We report on a case of BPB successfully treated by surgical resection.

### Case

A 73-year-old male presented with bloody sputa for a month. Chest X-ray revealed a large mass behind the right diaphragm (Fig. 1). Computed tomography (CT) showed a large mass about 7 cm in diameter in the S10 segment of the right lung (Fig. 2). Bronchoscopic curettage cytology revealed class V and a suspected adenocarcinoma (Fig. 3),

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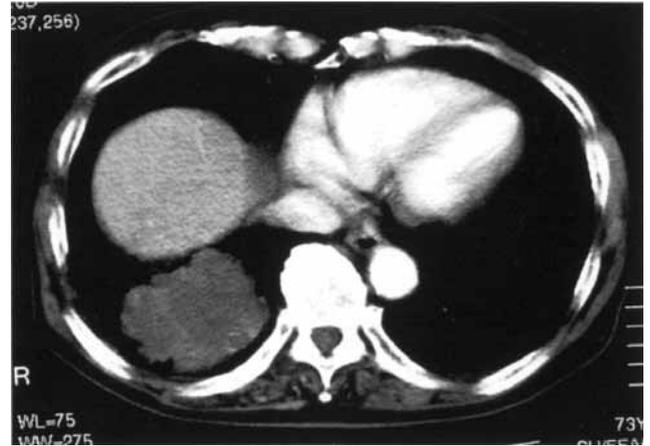
although a simultaneous biopsy was non-diagnostic. Tumor marker study showed carcinoembryonic antigen 8.6 ng/ml (<6.5 ng/ml), neuron-specific enolase 13.6 ng/ml (<7.8 ng/ml), squamous cell carcinoma associated antigen 2.5 ng/ml (<1.5 ng/ml), cytokeratin 19 fragment 3.1 ng/ml (<2.0 ng/ml), and type I collagen carboxy-terminal telopeptide 5.0 ng/ml (<4.5 ng/ml). Other data was normal. Systemic evaluations demonstrated no metastatic lesion. The patient underwent a right lower lobectomy and mediastinal dissection. Air leakage from pulmonary fistula persisted postoperatively and the patient was discharged on the 31st postoperative day.

A BPB was histologically diagnosed from the specimen (Fig. 4). The lesion mainly consisted of immature tumor tissue that had both epithelial and mesenchymal components (Fig. 5). The mesenchymal component was mostly short spindle cells; however, rhabdomyosarcomatous differentiation was focally observed.

Immunohistochemical studies revealed positive epithelial markers such as CAM5.2 (Fig. 6A), AE1/AE3, Ki-67 (MIB-1) and epithelial membrane antigen (EMA). Mesenchymal markers were also positive such as vimentin (Fig. 6B), and CD-34. S-100 protein stained both epithelial and mesenchymal components (Fig. 6C).

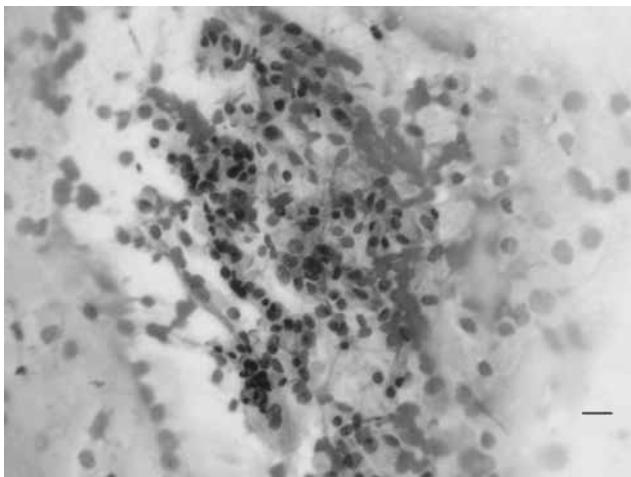


**Fig. 1.** Chest X-ray demonstrates an irregularly surfaced, well-demarcated mass behind the right diaphragmatic dome.



**Fig. 2.** Computed tomography shows a large mass in the right lower lobe of the lung at liver level. The tumor is poorly enhanced by contrast medium.

No mediastinal lymph node metastasis was proven and the patient was diagnosed with stage T2N0M0 disease. Postoperative adjuvant chemotherapy was not undertaken at his request. He is well without recurrence at 36 months after the operation.



**Fig. 3.** Bronchial curettage cytology reveals preomorphic tumor cells with irregular nuclei, suspected adenocarcinoma. (Papanicolaou:  $\times 200$ )

Desmin expressed focally in spindle cells indicating rhabdomyosarcomatous differentiation (Fig. 6D). Expression of placental alkaline phosphatase was also focal. Glial fibrillary acidic protein,  $\alpha$ -smooth muscle actin, and  $\alpha$ -fetoprotein were not expressed at all.

## Discussion

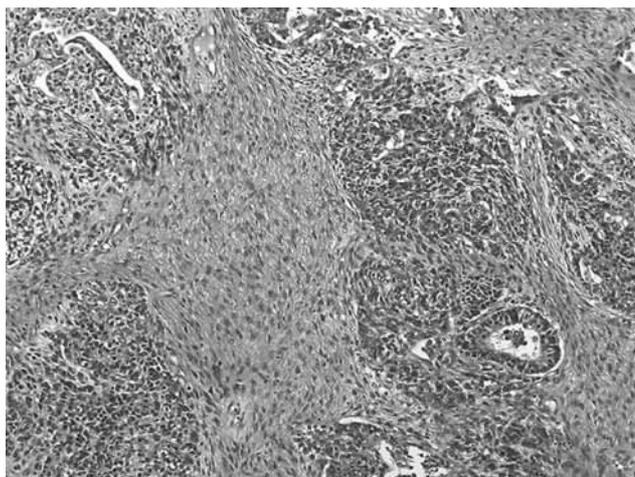
BPB is characterized by a unique histological heterogeneity of mixed epithelial and mesenchymal malignancies, and by its histological similarity to fetal lung tissue.

BPB was first described as embryoma of the lung by Barnard in 1952.<sup>1)</sup> In 1961, Spencer recategorized this neoplasm as pulmonary blastoma.<sup>1)</sup> Kradin et al. reported a subgroup with only epithelial malignant components in 1982.<sup>2)</sup> This monophasic pulmonary blastoma is now called well-differentiated fetal adenocarcinoma. Additionally, Manivel et al. reported another monophasic pulmonary blastoma with only mesenchymal malignant components.<sup>3)</sup> This tumor onset with a predilection for childhood is known as pleuropulmonary blastoma.

Thus, a pulmonary blastoma can be classified into 3 subgroups; BPB, a well-differentiated fetus adenocarcinoma (W DFA) as a monophasic epithelial tumor, and pleuropulmonary blastoma (PPB) as a monophasic mesenchymal tumor. However, according to the 1999 classification of the World Health Organization, W DFA and PPB are categorized into a variant of adenocarcinoma and soft tissue sarcoma of the lung, respectively.<sup>4)</sup> However, the histological origin of pulmonary blastoma remains



**Fig. 4.** Cut surface of the specimen shows yellowish white, well-encapsulated solid tumor tissue with clear demarcation; approximately 9 cm in diameter.



**Fig. 5.** Histopathological photo reveals a mixture of both immature mesenchymal sarcomatous tumor tissue (left half) along with immature epithelial carcinomatous tumor tissue (right half). This unique mixture of both components is a characteristic finding of a biphasic pulmonary blastoma. (original magnification:  $\times 100$ )

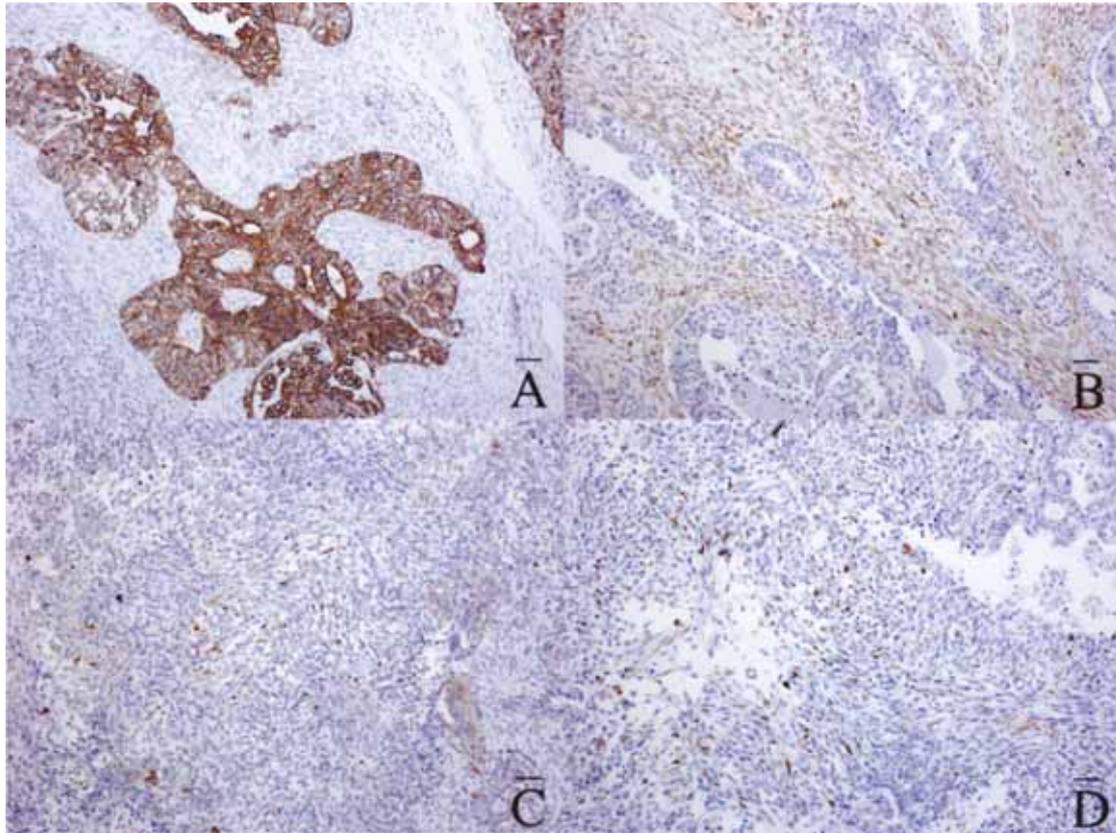
uncertain.

Immunohistochemical studies are useful in diagnosis of BPB. Especially with a combination of both epithelial and mesenchymal markers, each component can be clearly highlighted from each other. Furthermore, although the mesenchymal component of the tumor can show various differentiations, such as bone, cartilage, smooth muscle,

and skeletal muscle, usage of some mesenchymal markers may help in detailed diagnosis of the sarcomatous component. In our case, a desmin-positive,  $\alpha$ -smooth muscle actin-negative population was identified in the sarcomatous component. Desmin is an intermediate filament protein presenting in smooth muscle cells, striated muscle cells and myocardium.  $\alpha$ -smooth muscle actin was not expressed in skeletal or cardiac muscles, thus, the sarcomatous component of the tumor showed evidence of a rhabdomyosarcomatous feature.

Pulmonary blastoma frequently develops in the periphery of the lung as a rapidly growing well-demarcated large mass. When the tumor is recognized, most patients are symptomatic with a cough, (bloody) sputa, dyspnea, chest or back pain, which is sometimes accompanied with intrathoracic bleeding. Preoperative histopathological diagnosis by bronchoscopy, needle biopsy or other methods is difficult without obtaining a certain amount of specimen, due to the characteristic pleomorphic pattern. Prognosis is usually very poor and it is reported that two-thirds of patients with pulmonary blastoma die within 2 years of diagnosis.<sup>5)</sup> However, although there are still a limited number of cases, recent reports show favorable prognosis by surgical resection of cases with N0 disease<sup>6)</sup> or for cases that undergo combined surgery and preoperative chemotherapy.<sup>7)</sup>

Due to the rapid progress and poor prognosis of the tumor, when BPB is suspected from preoperative imaging findings, especially in patients with clinical N0 dis-



**Fig. 6.** Results of immunohistochemical staining.

- A:** Cytokeratin marker CAM5.2 is strongly expressed in the epithelial component of the tumor.  
**B:** Vimentin (a non-epithelial marker) stains mesenchymal component of the tumor.  
**C:** S-100 protein is expressed focally in both epithelial and mesenchymal components of the tumor.  
**D:** Desmin is expressed in some spindle cells. With negative expression of  $\alpha$ -smooth muscle actin, rhabdomyosarcomatous differentiation of the tumor is suggested.

ease, immediate surgical treatment should be considered even when histological diagnosis remains uncertain.

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