

## A Case Report of Inflammatory Pseudotumor of the Lung: Rapid Recurrence Appearing as Multiple Lung Nodules

Shinji Kato, MD,<sup>1</sup> Kazuo Kondo, MD,<sup>1</sup> Takao Teramoto, MD,<sup>1</sup> Tsuyoshi Harada, MD,<sup>1</sup>  
Hiroshi Ikeda, MD,<sup>2</sup> Kazuo Hara, MD,<sup>3</sup> and Yoshihisa Nagata, MD<sup>1</sup>

**An inflammatory pseudotumor (IPT), known as a plasma cell granuloma, is a relatively uncommon neoplasm with an unidentified etiology. To our knowledge, an early relapse with multiple lung nodules following lung resection and occurrences in multiple organs is extremely rare.**

The patient was a 49-year-old man who presented with left chest pain and fever. A chest film demonstrated an 8×8 cm mass in the left lower lobe. During thoracotomy in April 2001, a mass was seen to have invaded the diaphragm with remarkable pleural adhesion. The intraoperative pathological diagnosis was infiltration of inflammatory cells with no malignancy. Therefore, a partial resection of the left lower lobe was performed. Three months after the thoracotomy, a chest CT scan disclosed multiple nodular opacities bilaterally, and an open lung-biopsy of the right lung was performed in January 2002.

His past history included an excision of a mass on the penis in another hospital in 1994 and a subcutaneous mass that appeared on the right thigh and disappeared spontaneously following a needle biopsy in 1999. Pathologically there was no fundamental difference among his present lesion and the former two. The pathological diagnosis at each occurrence was inflammatory pseudotumor (IPT). In immunohistochemical study, the staining with smooth muscle actin cells was positive, but was negative for the staining with anaplastic lymphoma kinase (ALK).

With no evidence of a neoplastic process, these histopathological and immunohistochemical findings could imply that this case may be a postinflammatory reparative reaction, although his condition exhibited the clinically aggressive behavior of suspected lung metastasis. (*Ann Thorac Cardiovasc Surg* 2002; 8: 224–7)

**Key words:** inflammatory pseudotumor (IPT), lung, rapid recurrence, multiple lung nodules

### Introduction

Since inflammatory pseudotumor (IPT) is a benign disease which ambiguously presents with a tumor-like shadow having an irregular periphery on imaging, so a diagnosis discriminating between IPT and malignant tumor is essential. In addition, the natural history and ap-

propriate treatment of this disease remain unclear. However, there is a discrepancy between the pathologic findings and clinical behavior, including a recurrence and invasion to the adjacent organs. Such inexplicable characteristics prevent the surgeon from clearly identifying the disease.

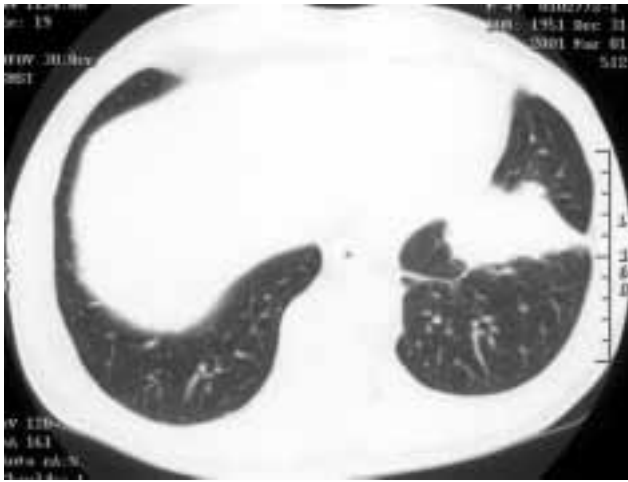
A patient will be discussed who presented with multicentric IPTs in the lung and other organs, which showed an interesting progression.

### Case

A 49-year-old male had a history that included the excision of a torus tumor on the penis in another hospital in

*From* <sup>1</sup>*Division of Chest Surgery, Department of Surgery,* <sup>2</sup>*First Department of Pathology, Aichi Medical University, and* <sup>3</sup>*Division of Pathology, Aichi Medical University Hospital, Aichi, Japan*

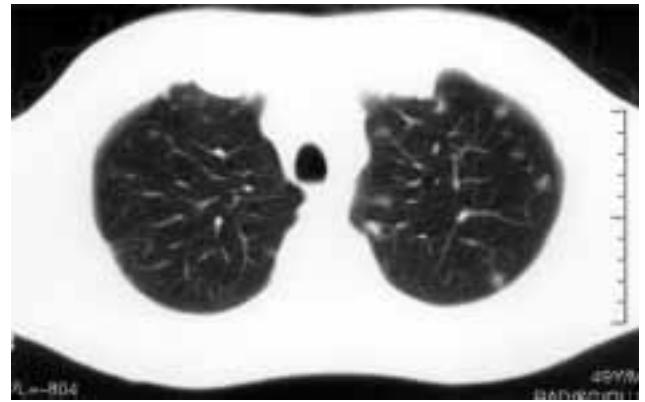
Received May 15, 2002; accepted for publication June 7, 2002.  
Address reprint requests to Shinji Kato, MD: Division of Chest Surgery, Department of Surgery, Aichi Medical University, 21 Karimata, Yazako, Nagakute, Aichi-gun, Aichi 480-1195, Japan.



**Fig. 1.** Chest plain CT scan on admission showed a mass shadow in the left lower lobe.

1994. The tumor was a 3×3 cm mass, and histopathologic examination showed chronic inflammation. Five years later, a similar mass appeared on his right thigh sized 1.5×1.5 cm, and he underwent needle biopsy in the same hospital, results showed it to be pathologically the same as the penile tumor. Although no additional operation was performed, the mass on the femur resolved spontaneously after the biopsy. Since January 2001, the patient had suffered from fever and chest pain and was under treatment for pneumonia in a nearby hospital. In March 2001 he was transferred to our hospital because a shadowy mass on the left lower lobe of the left lung was found on chest film obtained from a nearby hospital. Physical examination revealed no abnormality. Initially, several antibiotics were administered, and then an anti-tuberculous agent was administered orally for about four weeks. Despite these treatments, there was no regression of the shadowy mass. A chest CT scan demonstrated a shadowy 8-cm mass at the left lower lobe of the lung adjacent to the diaphragm (Fig. 1). The tumor had a well-defined margin, and was irregular in shape with pleural indentations, but neither calcification, cavitation, nor pleural effusion was found. Sputum and bronchoscopic studies revealed no organisms or malignant cells, but the mass showed an uptake of radioactive gallium.

Laboratory data on admission revealed an erythrocyte sedimentation rate of 97 mm/h and an increase in CRP to 2.09 mg/dl as a marker of inflammatory reaction. Although the antinuclear antibodies, P-ANCA and C-ANCA, were all within normal limits, Hb levels decreased from 12.3 to 10.2 g/dl. In addition, hypoalbuminemia was



**Fig. 2.** Post-surgical chest CT scan showed multiple nodular lesions in the bilateral upper lobe.

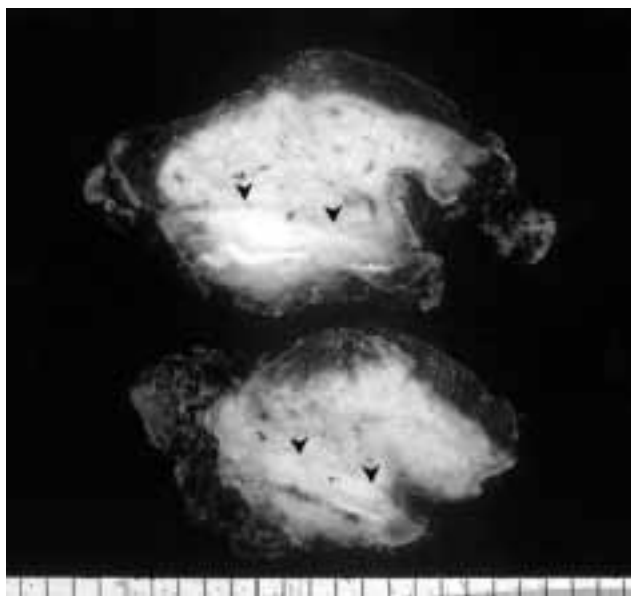
observed two months prior to surgery. A tuberculin test was positive, with an 18-12 mm rubor, but an examination for tubercle bacilli of the sputum by the polymerase chain reaction methods was negative. He had a 30-year history of smoking 15 cigarettes per day.

Thoracotomy was performed on April 23, 2001 because of a suspected bronchogenic carcinoma on imaging. An elastic hard tumor, 12 cm in diameter, was palpable in the lower lobe of the left lung at S<sup>8</sup>, and had invaded the upper lobe and diaphragm. Part of the tumor was transferred to pathology for frozen sections during the operation, and the pathological findings only demonstrated an invasion of the specimen tissue by inflammatory cells but no malignancy. Therefore, a resection of the left lower lobe combined with the upper lobe and a partial resection of the diaphragm was performed.

The patient demonstrated a favorable prognosis. However, after three months, a subsequent chest CT scan (Fig. 2) disclosed multiple nodular opacities in the bilateral lung, and an open-lung biopsy of the right lung was performed in January 2002. Pathological specimens of the penile tumor were obtained from a previous hospital admission and compared with specimens from the lower lobe of the left and right lungs.

#### **Histopathological findings** (Figs. 3, 4)

The cut surface of the tumor was grayish white, solid, uncoated, and had an irregular periphery (Fig. 3). Tumor growth extended beyond the diaphragm. The diaphragm on the abdominal cavity side was irregular in shape, but its structure remained intact. Histopathological examination demonstrated similar findings in all three lesions, i.e., the penile tumor of seven years before (Fig. 4A), left



**Fig. 3.** Macroscopic appearance of the tumor on the cross section. The tumor involved the diaphragm (arrowheads) in which the wall remains intact.

lung (Fig. 4B), and multiple nodules on the right lung (Fig. 4C). In the lungs, there were two major patterns, fibrous and inflammatory. The fibrous areas showed a prominent spindle cell component with collagenization. The inflammatory areas had heavy infiltrations of lymphocytes, plasma cells, histiocytes and germinal centers.

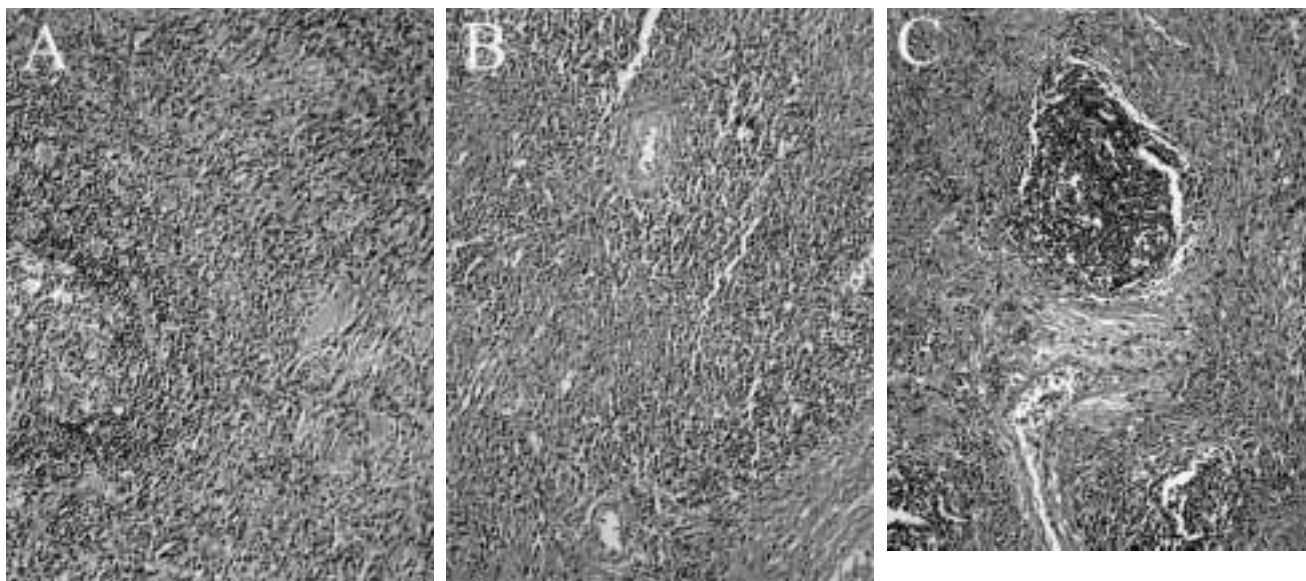
There was no nuclear atypism and only a few mitotic figures.

Immunohistochemistry was performed in the recurrent lung lesions. Spindle cells were positive for both CD 57 and smooth muscle actin. Anaplastic lymphoma kinase (ALK)-1 immunohistochemistry performed in the same lesion revealed negative staining. In situ hybridization for Epstein-Barr virus-encoded RNAs was performed, but no transcript was found.

### Comments

An inflammatory pseudotumor is a relatively uncommon neoplasm. There has been a report by Bahadori et al.<sup>1)</sup> of patients under 16 years of age developing inflammatory pseudotumors, most frequently primary tumor-like lesions of the lung. However, Cerfolio et al.<sup>2)</sup> reported that the incidence of the development of such tumors was only 23 of 56,400 cases who underwent thoracic surgery (0.04%). According to Golbert et al.<sup>3)</sup> pseudotumors accounted for only 0.7% of 1,075 cases of lung and bronchogenic tumors.

Though it has been generally acknowledged that IPTs involve a non-neoplastic process characterized by unregulated growth of inflammatory cells, the existence of a genuine involvement of neighboring structures or its rapid recurrence as multiple lung nodules in this case may ap-



**Fig. 4.** Histological findings of each tumor. There were two major patterns, fibrous and inflammatory. The fibrous areas showed a prominent spindle cell component with collagenization. The inflammatory areas had heavy infiltrations of lymphocytes, plasma cells, histiocytes and germinal centers.

A: penile tumor (hematoxylin-eosin: H.E. ×33), B: left lung tumor (H.E. ×33), C: multiple nodules in the right lung (H.E. ×33).

pear incongruous and raises the possibility of an IPT being a neoplasm. Some cases may be related to an infectious process.<sup>4)</sup> Recently, a proportion of IPTs occurring in the liver and spleen have been shown to represent a peculiar form of Epstein-Barr virus-associated follicular dendritic cell tumor.<sup>5)</sup> Coffin et al.<sup>6)</sup> referred to this disease as an inflammatory myofibroblastic tumor (IMT), and considered that discrimination between IMTs and inflammatory fibrosarcoma was very difficult. Recent cytogenetic reports have shown that at least some of the extrapulmonary IPTs contain various chromosomal aberrations, thus supporting the contention that this lesion is neoplastic in nature. Griffin et al.<sup>7)</sup> showed that clonal chromosomal rearrangements seen in IMTs fall within the ALK receptor tyrosine kinase locus on chromosome band 2p23. In Coffin et al.'s series,<sup>6)</sup> IPTs occurring outside the lung and lower urogenital tract, in particular the intraabdominal ones, are more likely to exhibit aggressive behavior such as invasion, recurrence, metastasis, and lesion-related mortality. Although metastasis was not observed in this series, it can be argued that this may merely represent multicentric involvement. However, this contention is difficult to either prove or disprove.<sup>8)</sup>

Among conservative therapies other than surgical treatment, there have been some good responses reported to radiation therapy<sup>9)</sup> and steroid hormone therapy.<sup>10)</sup> However, the definite effects of those treatments remain to be elucidated, because these other cases did not respond to them overall as well as to surgical treatment.

In the present case, despite the repeated recurrences with multicentric lesions, pathological and immunohistochemical findings showed no evidence of involvement of a neoplastic process from beginning to end. Interestingly, the recurrence of the lung lesions and spontaneous disappearance of the lesion on the thigh occurring subsequent to surgical intervention makes one suspect that this disease may be a systemic and postinflammatory reparative reaction. With this point of view in mind, it is

uncertain whether surgical intervention in these cases should be the treatment of choice. In addition, most surgeons may recommend a complete resection for IPTs.

## Acknowledgments

We would like to thank Mr. Tatsuhito Miyake and Mr. Yuji Nakagomi for their help in preparing the photographs.

## References

1. Bahadori M, Liebow A. Plasma cell granuloma of the lung. *Cancer* 1973; **31**: 191–208.
2. Cerfolio RJ, Allen MS, Nascimento AG, et al. Inflammatory pseudotumors of the lung. *Ann Thorac Surg* 1999; **67**: 933–6.
3. Golbert S, Pletnev SD. On pulmonary “pseudotumors.” *Neoplasma* 1967; **14**: 189–98.
4. Cheuk W, Woo P, Yuen KY, et al. Intestinal inflammatory pseudo-tumor with regional lymph node involvement: identification of a new bacterium as the etiologic agent. *J Pathol* 2000; **192**: 289–92.
5. Arber DA, Weiss LM, Chang KL. Detection of Epstein-Barr virus in inflammatory pseudotumor. *Semin Diagn Pathol* 1998; **15**: 155–60.
6. Coffin CM, Watterson J, Preist JR, Dehner LP. Extrapulmonary inflammatory myofibroblastic tumor (inflammatory pseudotumor): a clinicopathologic and histochemical study of 84 cases. *Am J Surg Pathol* 1995; **19**: 859–72.
7. Griffin CA, Hawkins AL, Dvorak C, et al. Recurrent involvement of 2p23 in inflammatory myofibroblastic tumors. *Cancer Res* 1999; **59**: 2776–80.
8. Chan JKC. Inflammatory pseudotumor: a family of lesions of diverse nature and etiologies. *Adv Anat Pathol* 1996; **3**: 156–71.
9. Hoover SV, Granston AS, Koch DF, et al. Plasma cell granuloma of the lung: response to radiation therapy: report of a single case. *Cancer* 1977; **39**: 123–5.
10. Shirakusa T, Kusano T, Motonaga R, et al. Plasma cell granuloma of the lung—resection and steroid therapy. *Thorac Cardiovasc Surg* 1987; **35**: 185–8.