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Pulmonary Inflammatory Pseudotumor
-A report of 28 cases-

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Background : *Pulmonary inflammatory pseudotumor is an uncommon benign lesion of the lung. In Korea, most literature of the pulmonary inflammatory pseudotumor was case reports.*

Methods : *We collected 28 cases of pulmonary inflammatory pseudotumor in Korea. This collective series included 4 cases from our hospital and 24 cases were reviewed from the literature since 1977. The analysis involved the age, sex, chief complaint, hematologic examination, size and location of the lesion, cavity formation, presence of calcification and treatment method.*

Results : *Male was more prevalent (81.5%) than female and mean age was 37.9 years old (6~63 yrs). Chief complaints were cough (44.4%), chest pain (29.6%), fever (22.2%), hemoptysis (15%), sputum (15%) and dyspnea (11.1%). There were asymptomatic cases in 11.1%. Hematologic examination revealed normal finding (53.3%) and anemia (20%). The mean size of the lesion was 4.76 cm (1.5~14 cm) and the locations were parenchymal (85.7%), endobronchial (10.7%) and endotracheal (3.6%). Except the endotracheal case, the lesions were in the right (46.4%), the left (42.8%) and bilateral (7.1%). Calcifications (18.5%) and cavitations (11.1%) were present. Diagnostic methods were open thoracotomy (82.1%), bronchoscopy (3.6%), needle aspiration biopsy (7.1%) and core needle gun biopsy (7.1%). Treatments were surgery (85.2%), steroid therapy (7.4%), rigid bronchoscopic removal (3.7%) and observation (3.7%). Postoperative recurrence occurred in only 1 case (4.3%).*

Conclusion : *Pulmonary inflammatory pseudotumor was more prevalent in the male, and patients presented with the respiratory symptoms were common. It was necessary to do surgery in most cases for diagnosis and/or treatment.*

Key Words : *Granuloma, Plasma cell, Pulmonary*

INTRODUCTION

Pulmonary inflammatory pseudotumor is a relatively rare benign tumor located in the lungs but could occur in the mesentry, greater omentum, liver, bladder and upper respiratory tract. Most of the patients are under 40 years of age and complain mainly of non-specific symptoms. Lesions are shown as pulmonary nodules or masses in which the border can be characteristically well distinguished on X-ray. Diagnosis of this tumor is difficult without surgical biopsy or resection. It is principally treated with surgery. This tumor was reported as fibrous histiocytoma, plasma cell granuloma and inflammatory pseudotumor in Korea. A total of 27 cases of pulmonary inflammatory pseudotumor have been reported in Korea,

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including 3 cases reported from Severance Hospital, until January 2001. However, most of the cases were simple case reports so that comprehensive discussion on pulmonary inflammatory pseudotumor was not enough in those series. Thus, we conducted a review of the literature on pulmonary inflammatory pseudotumor, including a case that we recently experienced, to examine the clinical features, diagnosis and treatment of this disease.

MATERIALS AND METHODS

1. Materials

We collected 28 cases of pulmonary inflammatory pseudotumor in Korea, including 4 cases that we experienced at the Severance Hospital, and supplemented from the literature reported as fibrous histiocytoma, plasma cell granuloma and inflammatory pseudotumor since 1977.

2. Methods

Through the review of the literature, we collected the patients' data, including age, gender, chief complaint, hematologic examination, size and location of the lesion, cavity formation, presence of calcification and treatment method. Referring to the studies already published, some items were not available for each case[2, 8, 10, 12, 14]. Information for the gender of the patient could be confirmed in 27 cases, that for the age in 20 cases, and that for the clinical pattern in 27 cases. Hematologic findings were described in 15 cases. Size of the lesion could be determined in 21 cases. Radiographic or pathologic findings were described in 27 cases. Diagnostic method could be confirmed in 28 cases and treatment method in 27 cases.

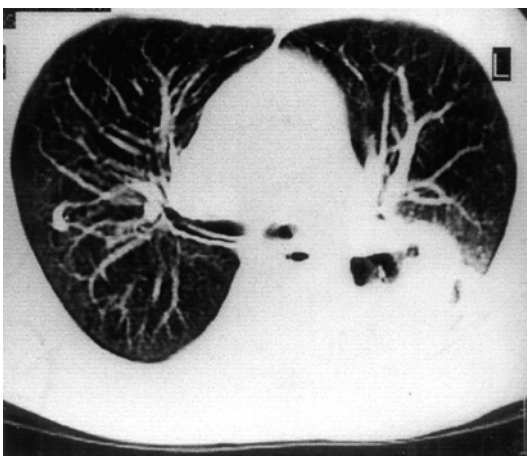

Figure 2. The chest CT scan showed a huge mass in the posterior segment of left upper lobe and the superior segment of left lobe. It disclosed the multiple cavitary or cystic lesions and air bronchograms.

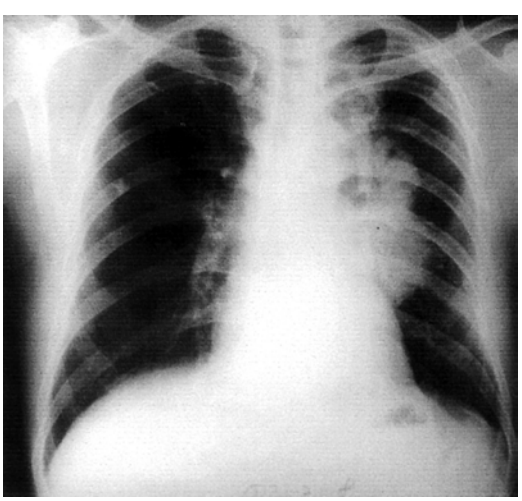

Figure 1. 52-year-old man with pulmonary inflammatory pseudotumor. The chest radiograph showed a huge mass-like density in the left upper and lower lung fields.

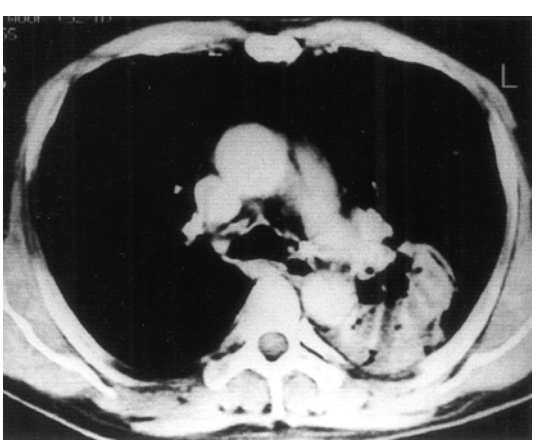

Figure 3. The chest CT scan showed a huge mass in the posterior segment of left upper lobe and the superior segment of left lobe. It disclosed the multiple cavitary or cystic lesions and air bronchograms.

RESULTS

The cases of pulmonary inflammatory pseudotumor reported in Korea are summarized in Table 1. Male was more prevalent than female in 22 out of 27 cases (81.5%) and the mean age was 37.9 years old (range: 6~63 yrs).

As for the clinical features, a majority of the patients,

Table 1. Summary of Features of Pulmonary Inflammatory Pseudotumors in Korea

Authors	Sex	Age (yr)	Chief complaint	Hematologic exam	Size, location of mass	Cavitation	Calcification	Treatment
Lee et al[1]	M	29	dyspnea, chest pain	neutropenia	4×2.5 cm, RUL* 7×6 cm, RML	no	no	bilobectomy
Kwak et al[2]	F	31	general weakness, headache	anemia	6.5×7.5 cm, LML	no	no	lobectomy
Kim et al[3]	M	17	hemoptysis, dyspnea	not described	1.5×1.5×1.2 cm, trachea	no	no	bronchoscopic removal
Yoo et al[4]	M	33	dyspnea on exertion, cough	normal	1.5 cm, endobronchus of left main	no	no	pneumonectomy
Chong et al[5]	F	44	chest pain	anemia	not described, RML and RLL	no	no	pneumonectomy
	M	30	dry cough	normal	diameter 2.5 cm, LLL	no	no	lobectomy
Lee et al[6]	F	24	cough, fever	normal	4×4 cm, RLL	no	no	lobectomy
	F	46	hemoptysis	normal	not described, LUL	no	no	lobectomy, recurred
Ryoo et al[7]	M	17	chest discomfort, cough	normal	5.5×6.0 cm, RUL	no	yes	lobectomy
Kim et al[8]	M	55	hemoptysis, cough, chest pain	not described	5×5 cm, RML	no	yes	lobectomy
	M	31	fever, chill, chest pain	not described	5×4 cm, LLL	yes	no	lobectomy
	M	58	cough, sputum	not described	5×7 cm, RUL	no	no	lobectomy
Park et al[9]	M	6	cough, fever	thrombocytopenia	not described, RML	no	no	lobectomy
Park et al[10]	-	-	bronchiectasis	not described	not described, LLL	-	-	lobectomy
Bang et al[11]	M	58	sputum	eosinophilia	6.0×3.3 cm, 3.0×2.5 cm, LLL, 2.8×2.4 cm, LUL, 3.2×2.5 cm, 1.6×1.2 cm, RLL	no	no	steroid therapy
Chae et al[12]	M	37	fever, chill, cough	not described	2×1.5×0.5 cm, endobronchus of LLL	no	no	segmentectomy
Jeon et al[13]	M	61	dyspnea on exertion, chest pain	leukocytosis, anemia	not described, left lung	no	yes	pneumonectomy
Kim et al[14]	M	-	right lower chest pain	not described	5 cm, RLL	no	no	wedge resection
	M	-	incidentally discovered	not described	2 cm, RML	no	no	wedge resection
	M	-	incidentally discovered	not described	3 cm, RUL	no	no	wedge resection
	M	-	incidentally discovered	not described	3 cm, RUL	no	no	lobectomy
	M	-	intermittent chest pain	not described	4 cm, LLL	no	no	lobectomy
	M	-	blood tinged sputum productive cough	not described	6 cm, LUL	no	no	lobectomy
	M	-	cough, purulent sputum	not described	not described, RUL, RLL, and LLL	yes	no	not described
Kim et al[15]	M	46	right upper quadrant pain	normal	5.0×4.0 cm, RUL	no	no	wedge resection
	F	20	dyspnea, cough, sputum	normal	not described, endobronchus of right main	no	yes	lobectomy
Choi et al[16]	M	63	intermittent fever	elevated ESR	3 cm, LUL	no	yes	spontaneous regression
Kim et al**	M	52	fever, cough, hemoptysis	normal	7×7×14 cm, LUL and LLL	yes	no	steroid therapy

* Abbreviations: RUL, right upper lobe; RML, right middle lobe; RLL, right lower lobe; LUL, left upper lobe; LLL, left lower lobe

** Author's case recently experienced in Severance Hospital

12 cases (44.4%) out of 27 cases, complained of cough, followed by chest pain in 8 cases (29.6%), fever in 6 cases (22.2%), hemoptysis and sputum in 4 cases (15%), respectively, and dyspnea in 3 cases (11.1%). Other symptoms, including dyspnea on exertion, general weakness, headache, upper abdominal pain and blood tinged sputum, were present in one case, respectively. Respiratory symptoms were present in 22 cases (78.6%) out of 28 cases at the time of diagnosis. Three cases (11.1%) were asymptomatic.

Among those 15 cases in which the hematologic findings could be determined, there was normal finding in 8 cases (53.3%), anemia in 3 cases (20%) and neutropenia, thrombocytopenia, eosinophilia, leukocytosis, elevated ESR in one case, respectively (6.7%). Leukocytosis was observed together with anemia in one case[13].

Based on the longest diameter, the average size of the lesion was 4.8 cm (1.5～14 cm). As for the location of the lesion in 28 cases, there was lung parenchymal lesion in 24 cases (85.7%), endobronchial lesion in 3 cases (10.7%) and endotracheal lesion in 1 case (3.6%). Other than the endotracheal lesion, the lesion was in the right side in 13 cases (46.4%), in the left side in 12 cases (42.8%) and bilateral in 2 cases (7.1%).

In 27 cases with radiographic or pathologic findings stated, calcification was seen in 5 cases (18.5%)[7, 8, 13, 15, 16] and cavity formation was seen in 3 cases (11.1%)[8, 14].

As for the diagnostic methods, the open thoracotomy was the most prevalent with 23 cases (82.1%) out of 28 cases; among these 23 cases, one case was diagnosed accidentally after the patient underwent left lower lobectomy due to bronchiectasis. Otherwise, the tumor was totally removed using a bronchoscope in 1 case (3.6%)[3], and was diagnosed through percutaneous fine needle aspiration (FNA) biopsy in 2 cases (7.1%)[11, 16] and core needle gun biopsy in 2 cases (7.1%)[14].

As for treatment, thoracotomy was performed in 23 cases (85.2%) out of 27 cases. Rigid bronchoscopic removal was performed in 1 case (3.7%)[3]. Prednisolone therapy was done in 2 cases (7.4%) out of 27 cases; in one case, a daily dose of 15 mg was given for 45 days with tapering[11]. We used 20 mg of prednisolone on the first day and tapered it within the 6 month treatment period. One case (3.7%) showed improvement with the lesion being decreased and symptoms improved with conservative treatment[16]. Recurrence after surgery was reported in 1 case (4.3%)[6] out of 23 cases.

DISCUSSION

As a relatively rare benign disease, the rate of inflammatory pseudotumor located in the lung is 0.7% of all tumors developing in the lung parenchyma and bronchus[17] and the rate of tumor development within the bronchus is 6.6% of pulmonary inflammatory pseudotumor[18] According to the study by Park et al.[10] in 1992, only one case (3.3%) of inflammatory pseudotumor was seen out of 30 cases of benign lung tumors. No gender difference was known to be present and more than a half of the patients were under 40 years of age and 15% of those patients were between the ages of 1～10 years[18, 19] In this study, 81.5% of the cases were male, 55% of them were under 40 years of age, and 1 case was a child under 6 years of age[9].

Pulmonary inflammatory pseudotumor is considered as an inflammatory or reactive lesion rather than neoplasm, and about 30% of the patients had a past history of respiratory infection[20, 21]. Although the cause of this disease has not been determined accurately, inflammatory lesions are thought to occur locally as a result of excessive response to tissue damages[22].

About 60～70% of the patients complained of cough, fever, dyspnea and chest pain[23]. The results of the present study showed that the symptoms were present in 24 cases (88.9%) out of 27 cases. The asymptomatic 3 cases were incidentally noted by chest X-ray abnormality[14].

Laboratory findings were usually within the normal ranges and some could show thrombosytosis, elevated ESR and multiclonal hypergammaglobuminemia[24].

Characteristic findings of chest X-ray revealed a solitary, peripheral, sharply circumscribed and lobulated mass[25]. Those cases with the lesions developed in the bronchus can show obstructive pneumonia or findings of atelectasis, can spread into the lung hilum or mediastinum and rarely accompany pleural effusion[25]. Calcification is seen with larger lesions[20] and lesions are known to form a cavity rarely[25]. Although calcification was reported in 5 cases in Korea[7, 8, 13, 15, 16], it was not related with the size of the lesion. Cavity formation could be seen in 3 cases[8, 14].

On gross examination of pulmonary inflammatory pseudotumor, a single oval intrapulmonary mass can be demarcated well, it shows golden-brown or red-brown color with no capsule and it is hard in consistency. It can show hemorrhage, necrosis or micro-calcification deposit[19, 25]. Histologically, mature plasma cells are the

major component of the mass, and fibroblasts, gelatinous substance and, characteristically, the Russel bodies are scattered in palisade or axel form within the hyaline material[19]. According to histological characteristic, it is distinguished into plasma cell granuloma and histiocytoma. The former form is composed of fibroblast, myofibroblast, collagen and inflammatory cells, and has spindle cells in long and short bundles[20]. In the latter form, collagen, spindle cells and macrophages are arranged in a whirlpool form and osteodysplasia and calcification can be present[21]. However, these two are considered to be the same disease since many pathologic findings are repeated and they are clinically very similar[26].

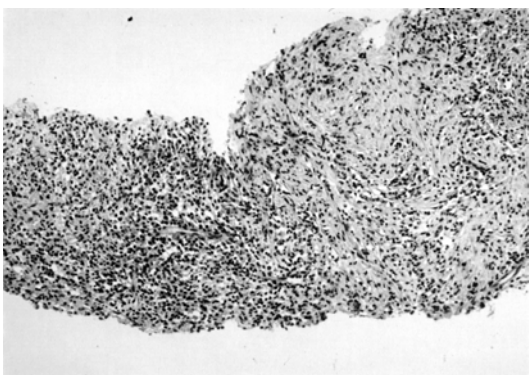

Figure 4. Microscopic findings of the biopsy specimen showed dense lymphoplasmacytic infiltration within fibrotic stroma. (H&E stain, X 40)

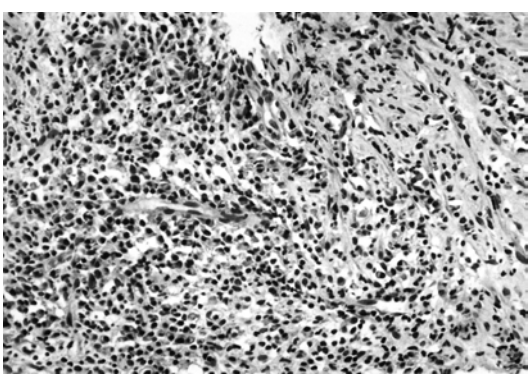

Figure 5. Microscopic findings of the biopsy specimen showed dense lymphoplasmacytic infiltration within fibrotic stroma. (H&E stain, X 200)

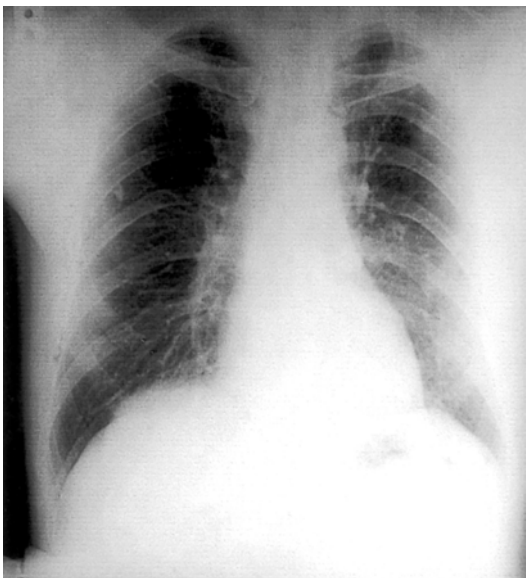

Figure 6. Twelve months later, the follow-up chest radiograph with the use of prednisolone revealed a marked-size reduction of the mass.

Since the findings of inflammation and fibrosis seen in pulmonary inflammatory pseudotumor can be found around the lesion of lung cancer as a reactive response, FNA biopsy may not be an appropriate method of diagnosing inflammatory pseudotumor[21]. However, the diagnosis of pulmonary inflammatory pseudotumor may be suggested if the combination of a localized density on a chest X-ray and the FNA cytologic findings an taken into account[27]. Therefore, repeated FNA biopsy can be recommended for diagnosis[28]. It was reported that a higher accuracy rate can be obtained using core needle gun biopsy compared with FNA biopsy in chest lesions[29]. Other than pathologic diagnosis after surgery, the diagnosis was made with percutaneous FNA biopsy in 2 cases and with core needle gun biopsy in 2 cases in Korea. However, since the findings of pulmonary inflammatory pseudotumor are non-specific and the disease is not distinguished well from lung cancer or metastatic cancer, the diagnosis of this disease before surgery is rare. Pulmonary inflammatory pseudotumor needs to be distinguished from sclerosing hemangioma, pseudolymphoma and malignant sarcoma[12].

Surgery is the treatment of choice in pulmonary inflammatory pseudotumor to distinguish between malignant tumors[18, 19, 22, 23]. Among 27 cases in which surgery was performed, thoracotomy was performed in 23 cases

and removal of the tumor using a bronchoscope was performed in 1 case. Recurrence is reported to be rare[18]. Only one case of recurrence was reported in Korea from the authors' affiliated hospital[6]. The inflammatory pseudotumor recurred in the meninges after 10 years and was treated with corticosteroids for 6 years. The follow-up periods were not long and the recurrence might be underestimated even in the world literature because the information from the review of the literature were collected at the time of the report. When lesions were impossible to remove surgically or not removed completely, steroid therapy[11, 24, 30] or radiation therapy[31] were also performed. There was a report that oral prednisolone at the dose of 2 mg/kg/d for 15 weeks reduced the size of lung infiltration[24]. Oral steroid could be administered in recurred cases after the surgery[30]. There was a complete disappearance of the mass on chest X-ray with 15 mg/d of prednisolone for 45 days in a Korean report[11]. We observed the disappearance of the mass on serial chest X-ray and symptomatic improvement with the administration of prednisolone started from 20 mg/d, then tapered for 6 months; no signs of recurrence were seen during the 12 month follow-up. There was a case in which the lesion was decreased and symptoms improved with no specific treatment.

In conclusion, pulmonary inflammatory pseudotumor was more prevalent in the male and patients presenting with the respiratory symptoms were common. It was necessary to do surgery in most cases for the diagnosis and/or treatment.

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