Radiographic Manifestations of Pulmonary Cryptococcosis

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Pulmonary cryptococcosis may occur in both immunocompromised and immunocompetent hosts. The purpose of the present study was to review the radiologic findings of pulmonary cryptococcosis in King Chulalongkorn Memorial Hospital.

The radiographs and computed tomography of the chests of the patients who had a diagnosis of pulmonary cryptococcosis, between 1998-2001, were retrospectively reviewed. Seven patients were included. Five were HIV infected; three had diffuse reticulonodular opacities, two (of the three) patients also had accompanying cavities; two had solely pleural effusion. Two patients were immunocompetent; one had a pulmonary nodule and another one had an endobronchial lesion and multiple pulmonary masses in the collapsed lung seen on CT scan, which were consistent with cryptococcoma. None had adenopathy.

There was a difference in the radiologic manifestations between immunocompromised and immunocompetent hosts. Knowledge in radiographic features in pulmonary cryptococcosis should help radiologists to early recognize the disease and may improve the treatment outcome.

Keywords: *Pulmonary cryptococcosis, Cryptococcoma, Endobronchial lesion, Radiologic findings*

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Cryptococcus neoformans, also known as *Torula histolytica* or European blastomycosis, is an oval or round encapsulated non-mycelial, budding yeast that is easily isolated from soil and pigeon droppings throughout the world. Its capsule, made of polysaccharide, is probably the most visible and well-known distinguishing feature that is best seen on India ink preparations. Although infection most likely begins after inhalation, the lungs are the second most commonly affected organ after the meninges[1]. It may infect both immunocompetent and immunocompromised hosts. The described radiologic manifestations of pulmonary cryptococcosis are diverse and depend on immune status[2-4]. Most common findings are single or multiple pulmonary nodules and bilateral airspace consolidation[2-5].

A few case reports of pulmonary cryptococcosis have been published in Thailand[6-8]. To the authors' knowledge; there is no reviewed study of radiologic spectrum of this disease in Thailand. The aim of the present study was to review radiologic findings of pulmonary cryptococcosis both in immunocompetent and immunocompromised patients in King Chulalongkorn Memorial Hospital.

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Material and Method

The present study was a retrospective review of all the medical and pathological records of pulmonary cryptococcosis in King Chulalongkorn Memorial Hospital from January 1998 to December 2001. Eighteen patients with a diagnosis or presumptive diagnosis of pulmonary cryptococcosis were found. Seven patients were included in the present study. In these patients, the diagnosis of cryptococcosis was confirmed by identifying the organism on sputum (n = 2), bronchoalveolar lavage (n = 1), pleural biopsy (n = 1), lung tissue histopathology from lobectomy and pneumonectomy (n = 2) and CSF (n = 3). One patient had the organism identified on bronchoalveolar lavage and

pathological specimen as well as CSF. Three patients also had positive serum cryptococcal antigen.

Eleven patients were excluded from the study because there were no laboratory confirmations or films available.

The plain chest radiographs of all the 7 patients and a CT scan of one patient were reviewed by two radiologists who did not know the patients' clinical data. The presence and distribution of parenchymal opacity, of nodule or mass, of lymphadenopathy and presence of pleural effusion were observed. Clinical symptoms at presentation were obtained by chart review.

Results

Six of the seven patients were male and one was female. The ages of patients ranged from 22 to 54 years with a mean age of 36 years. Five of the seven patients were HIV infected patients and two were immunocompetent hosts with no known underlying diseases.

Of five patients who were HIV infected, two had concurrent cryptococcal meningitis and presented with clinical manifestation of meningitis. Three patients had nonspecific respiratory symptoms such as cough, chest pain and dyspnea for 1-3 months. Three of the five patients had diffuse reticulonodular opacities without predominant zone. Two of the three patients had accompanying large cavities with approximately 7-8 mm of maximal wall thickness (Fig. 1). Two of the five HIV-infected patients had pleural effusion as a single chest abnormality. The pleural effusion in both patients was a small to moderate amount (Fig. 2). No evidence of enlarged hilar or mediastinal node was noted in the chest radiographs of these patients.

Of the two immunocompetent patients, one had no clinical symptoms but incidental pulmonary abnormality was identified on the chest radiograph. His chest radiograph revealed a 2-cm pulmonary nodule at the left lower lobe (Fig. 3). Left lower lobectomy was performed, and cryptococcoma was shown histopathologically. Another patient presented with fever, hemoptysis and alteration of consciousness resulting from cryptococcal meningitis. He also had a previous history of pulmonary tuberculosis with complete antituberculosis treatment 4 years ago. His chest radiograph revealed total left lung atelectasis (Fig. 4). The CT scan was obtained and showed an endobronchial mass in the left main bronchus causing atelectasis of the left lung. In the collapsed left lung there were also multiple pulmonary masses of various sizes; the largest mass was 4.3 x 6 cm (Fig. 4). Some scattered

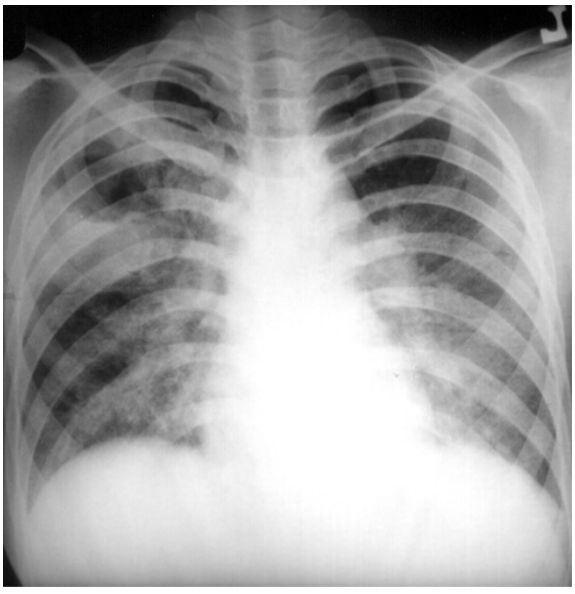

Fig. 1 Frontal chest radiograph of a 22-year-old HIV infected woman shows diffuse bilateral reticulonodular opacities with a large, 7-mm thick-walled cavity in the right upper lung

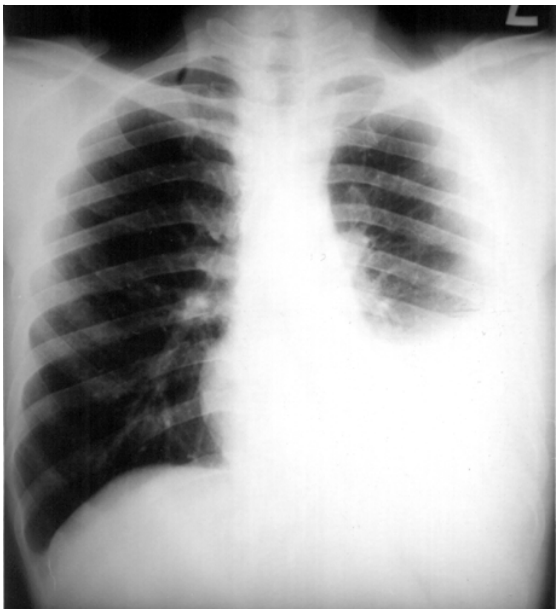

Fig. 2 Frontal chest radiograph of a 34-year-old, HIV infected man shows moderate left pleural effusion, and pleural biopsy shows cryptococcal organism

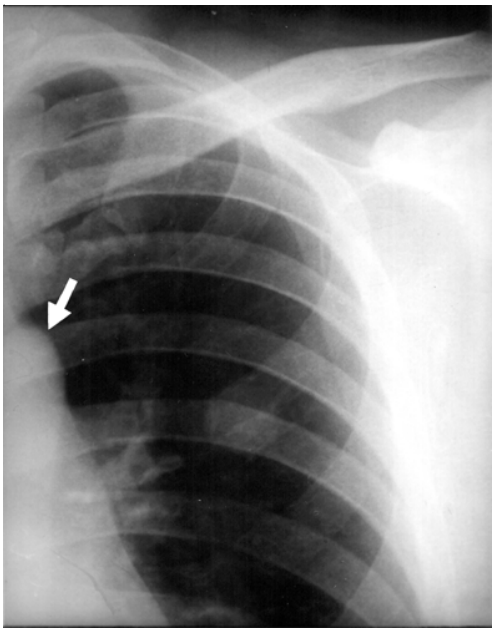

Fig. 3 Frontal chest radiograph of a 35-year-old, non-HIV infected man reveals a 2x2 cm rounded well-defined noncalcified pulmonary nodule located in the superior segment of the left lower lobe (arrow)

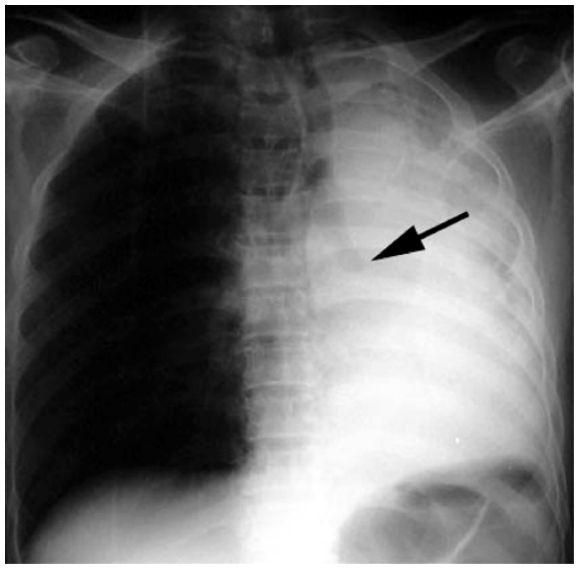

Fig. 4(A-C) A 54-year-old, non-HIV infected man who presented with hemoptysis and meningitis

Fig. 4A Frontal chest radiograph shows complete atelectasis of the left lung with ipsilateral mediastinal shift, abrupt cut off of the left main bronchus is noted (arrow)

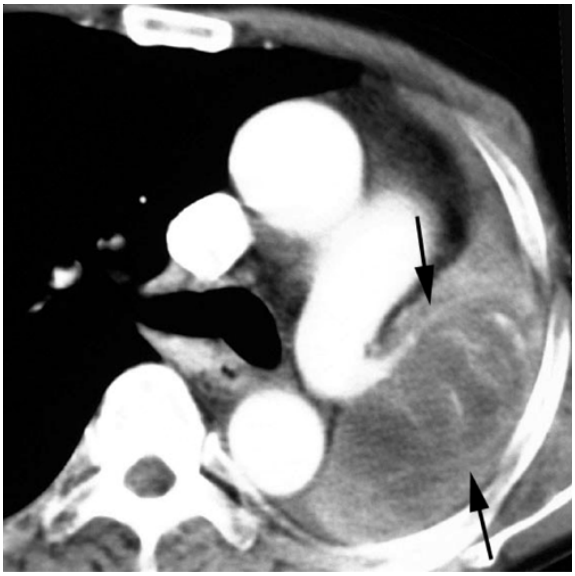

Fig. 4B CT chest at the level of carina shows a large mass (arrows) which displaces the branch of the left pulmonary artery anteriorly, histopathologically consistent with cryptococcoma

Fig. 4C CT scan at the level of the right main pulmonary artery, shows a small endobronchial nodule in the left main bronchus (black arrow). Multiple masses are also seen (white arrows)

Table 1. The radiographic findings, immune status and clinical symptoms of each patient

Case No. (age/sex)	Radiographic findings			Clinical symptoms
	Parenchymal abnormality	Pleural effusion	Enlarged node	
		HIV-infected patients		
1 (22/F)	Diffuse reticulonodular opacities with large 6 x 7.5-cm cavity in right upper lung	No	No	Cough 1 month
2 (27/M)	Diffuse reticulonodular opacities	No	No	Meningitis, cryptococcal infection of cervical node
3 (28/M)	Diffuse reticulonodular opacities with 11 x 14-cm cavity in superior segment of LLL	No	No	Fever, cough and chest pain 1 mo
4 (34/M)	No	Moderate, left	No	Dyspnea and cough 3 mo
5 (52/M)	No	Small-moderate, right		Meningitis
		Immunocompetent patients		
6 (35/ M)	A 2-cm well-defined, rounded, noncalcified nodule in LLL	No	No	No symptom
7 (54/ M)	Left lung atelectasis	No	No	Meningitis and hemoptysis

Table 2. Frequency of each radiographic finding

Radiographic appearances	Numbers of cases (n = 7)	
	HIV-infected	Immuno-competent
Reticulonodular opacities	3	0
Air-filled cystic space	2	0
Nodule(s) or mass(es)	0	2
Endobronchial lesion	0	1
Pleural effusion	2	0
Hilar or mediastinal lymphadenopathy	0	0

calcifications in the left lung were also noted. Left pneumonectomy was performed. Again, a cryptococcoma in left main bronchus and multiple pulmonary cryptococcomas in the collapsed left lung were found. No patients had lymphadenopathy or pleural effusion. Radiographic findings, immune status and clinical courses of the patients are shown in Table 1 and the frequency of each radiographic finding is formulated in Table 2.

Discussion

Although the lung is thought to be the portal of entry for *Cryptococcus neoformans*, most cases of pulmonary infection are not recognized because they have no or mild symptoms. Of the persons who develop clinically symptomatic disease, 50-80% are immunocompromised[2,9]. With the emergence of HIV infection, pulmonary cryptococcosis has a clearly increased prevalence. It is now the most common fungal infection of the lungs and accounts for approximately 15% of all pneumonia in this population[10].

There are three major patterns of radiologic parenchymal abnormalities in pulmonary cryptococcosis: a discrete pulmonary nodule or mass, lobar or segmental consolidation, and diffuse, bilateral small nodular or reticulonodular pattern[5,11].

In agreement with prior radiographic studies[2,9], patterns of radiologic manifestations between immunocompromised and immunocompetent hosts were different. Both diffuse pulmonary opacity and mass(es) are major findings in the immunocompromised hosts[4,5]. Cavity and pleural effusion were limited to this group. In contrast to immunocompromised host, healthy individuals tend to have a radiographic patterns of pulmo-

nary nodules or masses, which often make radiologists worrisome of malignancy[6,8,12]. Diffuse pulmonary opacity also presented in the HIV-negative group, particularly in patients with respiratory symptom[13], but this radiologic pattern was not found in the two HIV-negative patients in this study.

In the present study, none had hilar or mediastinal lymphadenopathy. Six of the seven patients had only plain radiographs, which may limit the sensitivity in detection of an enlarged node. However, in the previous CT studies of pulmonary cryptococcosis, a small numbers of cases had enlarged nodes and most of them were only approximately 1 cm in diameter[4,5,10].

Interestingly, one of the immunocompetent patients had an endobronchial mass in the left main bronchus, which pathologically represented cryptococcoma, causing complete left lung atelectasis. This manifestation is rare, to the authors' knowledge, there are few cases reported in the literature[14-18].

In the present study, one patient had multiple scattered calcifications in the collapsed lung parenchyma. However, this patient also had a past history of pulmonary tuberculosis, thus it is difficult to determine what is the exact cause of these calcifications. In previous reports[3,11], calcification is a rare finding in pulmonary cryptococcosis. In the presented case these calcific foci may be the result either of previous tuberculous infection or of pulmonary cryptococcosis.

Despite the immunocompromised patients being limited to HIV-infected patients, according to the study by Lacomis et al, there was no difference in radiologic findings between HIV infected patients and other immunocompromised patients[4].

The drawbacks in the present study were that there was a small number of cases and the authors eliminated cases with concomitant disease in the chest that could be confused with cryptococcosis. These precluded a detailed statistical analysis of the imaging, and the number of patients in the present study did not represent the true incidence of pulmonary cryptococcosis in King Chulalongkorn Memorial Hospital during the study period.

Conclusion

Pulmonary cryptococcosis is being recognized with increased frequency in both immunocompetent and immunocompromised hosts. Radiologic manifestations are affected by immune status. Air-filled cystic spaces and pleural effusion exclusively occur in the immunocompromised group. Single or multiple pulmonary nodules or masses are the most common findings in normal hosts, particularly in the absence of respiratory symptoms. Adenopathy and calcification were not found in both groups. An endobronchial mass is a rare manifestation of pulmonary cryptococcosis, but found in the present study. Knowledge in radiographic features of pulmonary cryptococcosis should help radiologists to be aware of the disease and early diagnosis to improve the treatment outcome.

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ลักษณะภาพถ่ายรังสีของโรคคริปโตคอคโคซิสของปอด

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โรคคริปโตคอคโคซิสของปอดเกิดได้ทั้งในผู้ที่ภูมิคุ้มกันปกติและผิดปกติ การศึกษานี้เพื่อรวบรวมลักษณะทางภาพรังสีของคริปโตคอคโคซิสของปอดในผู้ป่วยที่มาโรงพยาบาลจุฬาลงกรณ์ในช่วงปีพ.ศ. 2541-2544

ผู้ป่วย 7 คนได้รับการวินิจฉัยว่าเป็นคริปโตคอคโคซิสของปอดและอยู่ในการศึกษาครั้งนี้ มี5 คนติดเชื้อเอชไอวี และ 2 คนมีภูมิคุ้มกันปกติ ภาพรังสีในกลุ่มผู้ป่วยภูมิคุ้มกันบกพร่องให้ลักษณะเป็นจุดและร่างแหเล็ก ๆ เป็นโพรงหนอง หรือมีน้ำในช่องเยื่อหุ้มปอด ส่วนกลุ่มผู้ป่วยภูมิคุ้มกันปกติให้ลักษณะเป็นก้อนใหญ่ก้อนเดียวหรือหลายก้อนในเนื้อปอด และก้อนอุดตันหลอดลม ไม่พบผู้ป่วยรายใดให้ลักษณะต่อมน้ำเหลืองโต

พบว่าลักษณะทางภาพรังสีของคริปโตคอคโคซิสของปอดในผู้ป่วยภูมิคุ้มกันปกติและภูมิคุ้มกันบกพร่องมีความแตกต่างกัน ความรู้เกี่ยวกับลักษณะทางภาพรังสีของคริปโตคอคโคซิสของปอดจะช่วยให้แพทย์วินิจฉัยโรคได้เร็วขึ้น ซึ่งจะช่วยให้ผลการรักษาดีขึ้นได้