

Research article

# Radiological features of AIDS complicated by pulmonary cryptococcosis: Literature review and a report of 10 cases

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## Abstract

**Purpose:** To retrospectively analyze the clinical data and radiological features of AIDS complicated by pulmonary cryptococcosis (PC) for more knowledge about the condition and its diagnosis.

**Methods:** A total of 10 cases with AIDS complicated by pulmonary cryptococcosis was recruited as the subject of the study, and all the clinical and radiological data were collected. The patients included 6 males and 4 females, aged 40–58 years. The CD4<sup>+</sup> T cell count was below 100/μl in 8 cases. All of them were pathologically or etiologically diagnosed with AIDS complicated by PC, and received digital radiography (DR) and CT examination. All the radiological images were retrospectively analyzed by two senior radiologists who knew nothing about the patients.

**Results:** The radiological findings were categorized into 3 types: (1) multiple miliary nodules in 2 cases (20%), which distributed in bilateral lung apex and dorsal segment of lower lobe, being 2–3 mm–2 cm in diameter, with “halo sign” around the larger lesion; (2) singular nodule or mass in 3 cases (30%), which was located in the peripheral region of lung, also with “halo sign” around the lesion; (3) cavity in 5 cases (50%), which was singular or multiple, with uneven thickness of the cavity wall and inner-wall nodule. In a few cases, enlarged mediastinal lymph node and pleural effusion accompanied.

**Conclusion:** The radiological signs featured AIDS complicated by pulmonary cryptococcosis such as singular or multiple nodules with cavity and “halo sign” can facilitate its diagnosis. But the diagnosis should be made in combination to the clinical history.

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**Keywords:** AIDS; HIV; Pulmonary cryptococcosis (PC); Lung; Halo sign; Cavity; Nodule

## 1. Introduction

Fungal infection is the most common opportunistic infection in patients with HIV/AIDS, whose pathogen is the most commonly candida, followed by pneumocystis carinii and cryptococcus [1–3]. Pulmonary cryptococcosis (PC) is mainly caused by inhaled aerosols containing new cryptococcus and

its variants, which further lead to subacute or chronic pulmonary disease. Lung is the second most common target of the fungus, following the brain [4]. Recently, the incidence rate of PC sees an obvious increase due to the prevalence of AIDS, which demands more knowledge and accurate diagnosis of its pathogenic microorganism.

The onset of PC is mild, with non-specific clinical symptoms and routine laboratory findings. In addition to the greatly diversified radiological demonstrations due to different levels of immunity, the disease tends to be misdiagnosed. In recent years, many studies about radiological features of PC have been conducted in patients with normal immunity. However, radiological features of HIV/AIDS complicated by PC have been rarely reported. In order to increase the clinical

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understanding about HIV/AIDS complicated by PC, 10 cases of HIV/AIDS complicated by PC were retrospectively analyzed. By analyzing the clinical manifestations, CD4<sup>+</sup> T cell count and radiological features, we intended to further improve the diagnostic accuracy of the diseases for early appropriate intervention.

## 2. Materials and methods

### 2.1. Subjects

All the cases were clinically diagnosed with AIDS, with HIV positive. The whole research protocol was approved by the ethics committee of our institution. Six cases were recruited from Zhongnan Hospital of Wuhan University during Nov. 2012 to Jul. 2014, 2 cases from Beijing Youan Hospital, and 2 cases from the Shenzhen 3rd People's Hospital. The subjects include 6 males and 4 females, aged 40–58 years with a mean of  $47.7 \pm 7.1$  years. Nine cases had a history of cough, sputum or chest pain, 4 cases had fever, 1 case had epilepsy symptom, 3 cases had symptoms of central nervous system, headache and nausea. Epidemiological investigation showed no history of close contact to pigeon or other poultries. Of all the cases, 4 were diagnosed by CT guided percutaneous fine needle lung puncture for biopsy with PC, 1 case was pathologically defined after surgery, 2 cases by multiple sputum cultures, and the other 3 cases experienced symptoms of central nervous system which were confirmatively diagnosed by cerebrospinal fluid with *Cryptococcus neoformans* positive. The lung lesions were cured by using amphotericin B and fluconazole therapy. CD4<sup>+</sup> T cell count and three times consecutive sputum tests showed mycobacterium tuberculosis negative and tuberculin test negative.

### 2.2. Equipment for radiological examination and statistical analysis

All cases received chest X-ray (GE Healthcare Definition 6000 DR) and CT scan (SIEMENS SOMATOM Definition 64). Routine chest CT scan was performed from the lung apices through the bases. Transverse thin-section CT scans were performed with the following parameters: tube voltage 120–140kVp, tube current 200–250 mA, slice thickness 2–5 mm, distance 2–5 mm 1.5 mm coronal and sagittal multi-planar reconstructions were achieved for the interested lesions in the lung. Six cases received contrast CT scan with high pressure injector using iodinated contrast agent 70–100 ml (iohexol 300 mg/ml) at a flow rate of 3.0–3.5 ml/s.

All the radiological images were retrospectively and blindly analyzed by two experienced radiologists. Scans were evaluated for the location, size, contour, margin and density of the lesions as well as their surrounding tissue changes, such as pleura, mediastinum, hilar lymph node of lung. The enhancement was also evaluated for the changes before and after contrast scans. For the cases receiving re-examination, dynamic changes before and after treatment were paid focused attention, including the changes of lesion size and quantity et al.

## 3. Results

### 3.1. Demographic and clinical data

Ten cases were analyzed in this study, including 6 male cases and 4 female cases with a male-female ratio of 3:2. Their age ranged from 40 to 58 years, with a mean of  $47.7 \pm 7.1$  years. Clinically, 1 case was asymptomatic, and 9 experienced nonspecific respiratory symptoms and other symptoms. All the 10 cases were confirmatively diagnosed with pulmonary Cryptococcosis, and all of them received laboratory test for serum CD4 T cell count. The demographic and clinical data were listed in Table 1.

### 3.2. Radiological demonstrations

Chest radiology demonstrated that the 10 cases of AIDS complicated by PC can be categorized into the following 3 types:

#### 3.2.1. Multiple miliary nodules

Multiple miliary nodules were demonstrated in 2 cases (20%), with scattering multiple miliary nodules at both lungs that mainly distributed at the lung apex and dorsal segments of lower lung lobe, ranging from 2–3 mm–2 cm in diameter. The lesions were shown with high density and favorably defined boundary. For the large nodules (with a diameter of above 1 cm), the central density was homogeneously high, and the surrounding manifested as ground glass opacity, known as the halo sign (Fig. 1).

#### 3.2.2. Singular nodule/mass

Singular nodule/mass was shown at the lung in 3 cases (30%), which progressively increased in size if inappropriately

Table 1  
Demographic and clinical data of the 10 cases.

N	10
Age (years old)	47.7 ± 7.1 (40–58)
Gender	
Male	6 (60%)
Female	4 (40%)
Clinical data	
Asymptomatic	1 (10%)
Cough and sputum	7 (70%)
Chest pain	5 (50%)
Epilepsy	1 (10%)
Headache	3 (30%)
Fever	4 (40%)
Diagnostic examination	
CT guided percutaneous needle lung biopsy	4 (40%)
Surgery	1 (10%)
Sputum culture	2 (20%)
Clinical confirmed	3 (30%)
CD4 <sup>+</sup> T lymphocyte cell count	53.8 (21–153)
Concurrent infection	
Tuberculosis	0
Cryptococcus meningitis	4 (40%)
Spore bacterium pneumonia	1 (10%)

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