

# Pulmonary infections mimicking cancer: report of four cases

Madhusudhan K S, Gamanagatti S, Seith A, Hari S

## ABSTRACT

**Lung infections infrequently simulate cancer, and their differentiation, based on imaging findings, can sometimes be difficult. The infections may be fungal, mycobacterial, parasitic or, rarely, viral. A biopsy is required to prove the infectious nature of the lesions. A specific diagnosis is necessary for initiation of appropriate therapy. We report four cases of chronic pulmonary infections, which were wrongly diagnosed as bronchogenic carcinoma based on radiological features. We also reviewed the existing literature.**

**Keywords:** actinomycosis, lung cancer, lung infections, mucormycosis, nocardiosis, tuberculosis

*Singapore Med J 2007;48(12):e327–e331*

## INTRODUCTION

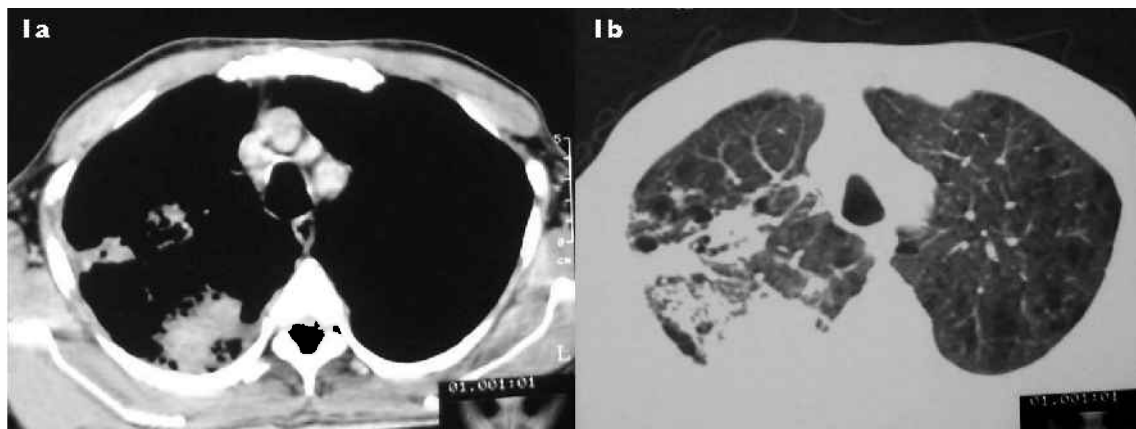
Lung infections mimicking malignancy are not uncommon.<sup>(1)</sup> A variety of lung infections have radiological features simulating cancer, especially when they are seen in an elderly patient presenting with cough and haemoptysis. The infections could be bacterial (fusobacterium, pseudomonas, streptococci), fungal (histoplasmosis, actinomycosis, nocardiosis, cryptococcosis, botryomycosis), mycobacterial

(*M. tuberculosis*, *M. kansasii*), parasitic (dirofilariasis) and, rarely, viral (cytomegalovirus).<sup>(1-5)</sup> Most of these are chronic infections. Some are seen in patients with compromised immune status. They do not respond to routine courses of antibiotics. Although these infections have to be considered in the differential diagnosis, malignancy should be considered first, based on the radiological feature. A biopsy is required for a specific diagnosis and treatment. We report four such biopsy-proven cases of chronic lung infections mimicking cancer on imaging.

## CASE REPORTS

### Case 1

A 63-year-old man, a farmer by occupation, presented with history of cough and haemoptysis for six months. He also gave a history of loss of appetite and weight. There was no fever. He is a chronic smoker and alcoholic for the past 40 years. He had no history of diabetes mellitus or hypertension. On examination, there were crepitations in the right infraclavicular area on auscultation. Routine laboratory investigations were normal. The chest radiograph showed a peripherally-located parenchymal opacity in the right upper and mid zone. Contrast-enhanced computed tomography (CT) showed a mass lesion in right upper lobe abutting the chest wall (Figs. 1a & b). The underlying ribs were normal. No mediastinal adenopathy was seen. The imaging features were nonspecific, but



**Fig. 1** Case 1. Axial CT images, taken with (a) mediastinal and (b) lung windows, show a lobulated mass lesion in the periphery of the posterior segment of the right upper lobe, which turned out to be actinomycosis on histopathology.

Department of  
Radiodiagnosis,  
All India Institute of  
Medical Sciences,  
New Delhi 110029,  
India

Madhusudhan KS,  
MD  
Senior Resident

Gamanagatti S, MD  
Assistant Professor

Seith A, MD  
Associate Professor

Hari S, MD  
Assistant Professor

**Correspondence to:**  
Dr Shivanand  
Gamanagatti  
Tel: (91) 11 2658 9900  
ext 4889  
Fax: (91) 11 2658 8700  
Email: shiv223@  
rediffmail.com

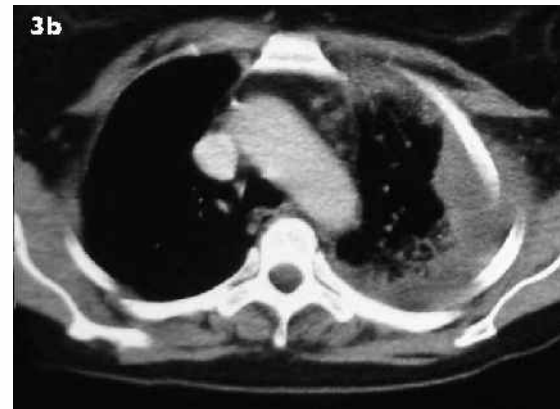
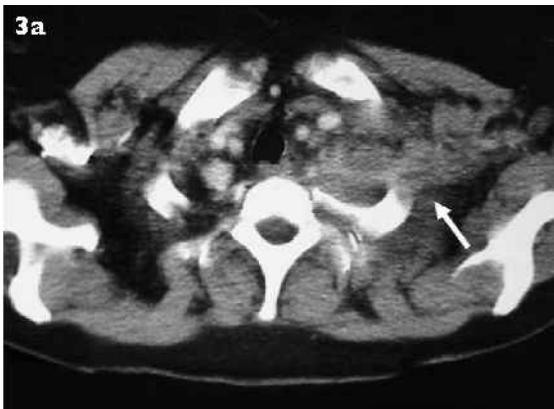


**Fig. 2** Case 1. Follow-up axial CT image taken after three weeks of treatment with penicillin shows near-complete resolution of the lesion.

in an elderly chronic smoker with haemoptysis, the possibility of carcinoma was considered. A bronchial aspirate showed inflammatory cells with few columnar cells; it was negative for acid-fast bacilli or malignant cells. A CT-guided biopsy was done, and findings were suggestive of actinomycosis. The patient was given specific parenteral antibiotic therapy for a period of one month. Follow-up CT done after three weeks of treatment showed significant resolution of this lesion (Fig. 2).

**Case 2**

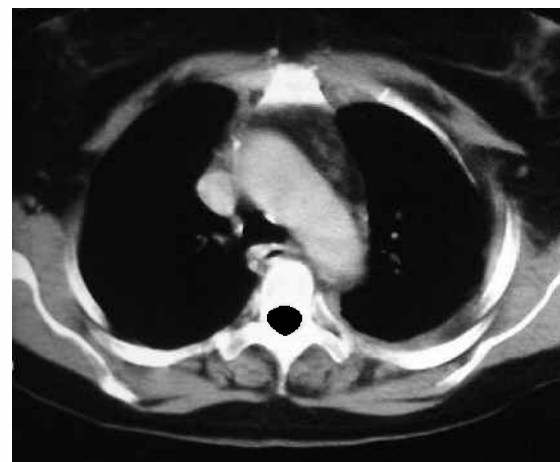
A 45-year-old woman presented with a history of fever, and pain over the left chest wall and left scapular region of four months duration. She had no history of cough or haemoptysis. She was not a smoker or alcoholic. She did not have diabetes mellitus and was not on any medication. On examination, there



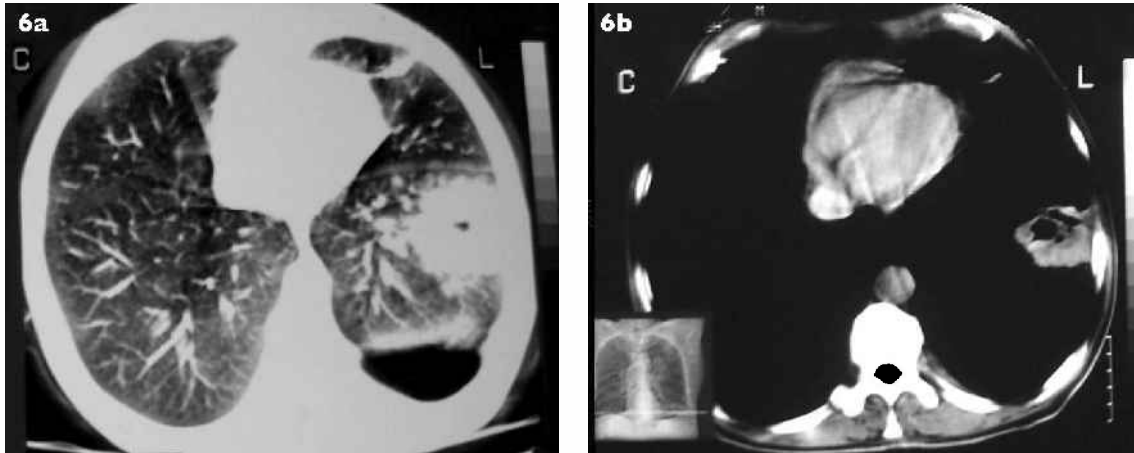
**Fig. 3** Case 2. Axial CT images of the (a) lower neck and (b) superior mediastinum show a soft tissue mass in the left supraclavicular region involving the brachial plexus (arrow) and homogeneous soft tissue density lesion in the periphery of the left upper lobe. The diagnosis was mucormycosis.



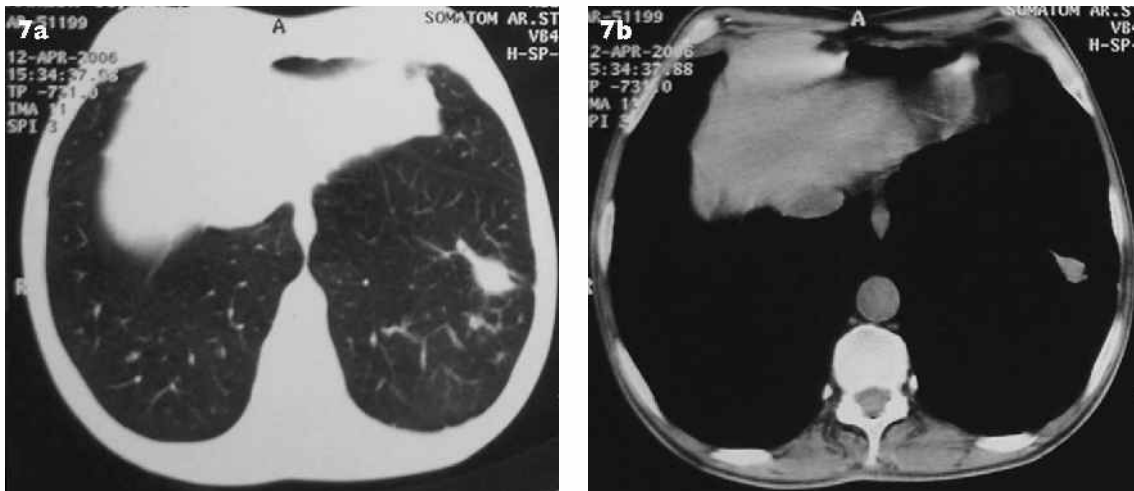
**Fig. 4** Case 2. Coronal post-contrast T1-W MR image shows involvement of the brachial plexus by the soft tissue extending from the lung apex (arrows).



**Fig. 5** Case 2. Follow-up axial CT image taken after two months of antifungal therapy shows marked improvement in the lung lesions.



**Fig. 6** Case 3. Axial CT images, taken with (a) lung and (b) mediastinal windows, show a cavitating mass with spiculated margins in the anteromedial basal segment of the left lower lobe. Adjacent pneumothorax was also noted. The pathological diagnosis was tuberculosis.

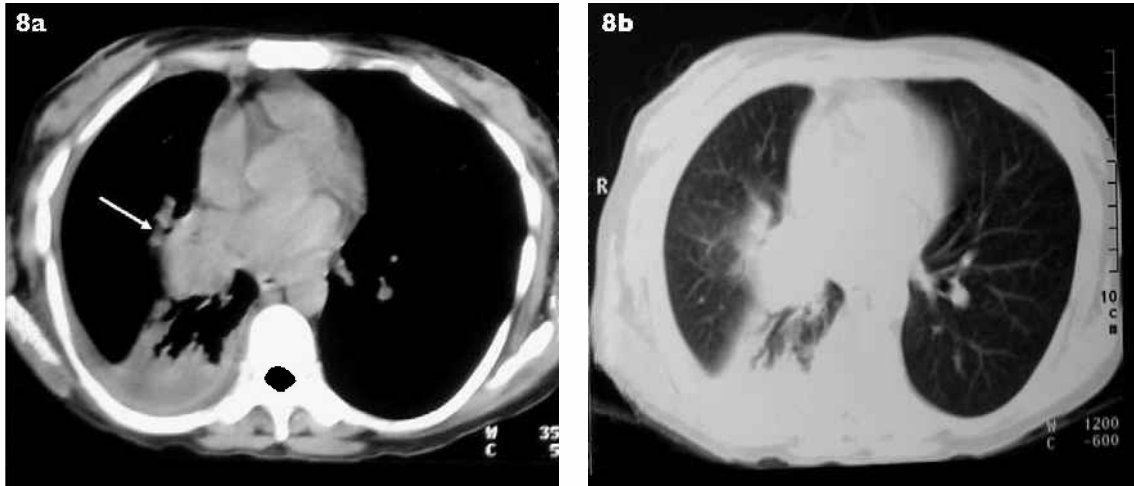


**Fig. 7** Case 3. Follow-up axial CT images, taken with (a) lung and (b) mediastinal windows, after two months of antituberculous therapy show significant reduction in the size of the lesion.

were reduced breath sounds in the left scapular region and decreased sensation along the C8-T1 nerve root distribution. Chest radiograph showed an ill-defined parenchymal opacity occupying the left upper and mid-zones, without any calcification or cavitation. CT showed a soft tissue lesion along the chest wall in left upper lobe (Fig. 3b). The adjacent lung showed interstitial thickening. There was another soft tissue lesion along the left lower neck in the region of brachial plexus (Fig. 3a). With this imaging appearance, a provisional diagnosis of Pancoast tumour was made. A CT-guided biopsy was done and the histopathology revealed features of mucormycosis. Magnetic resonance (MR) imaging was done to define the exact extent of the disease (Fig. 4). The patient was given antifungal therapy for two months. Significant improvement was observed at the end of two months (Fig. 5).

### Case 3

A 60-year-old man presented with history of cough and intermittent fever of three months duration, with occasional bouts of haemoptysis. He was a chronic smoker for the past 30 years. He had no history of diabetes mellitus or hypertension. Clinical examination was unremarkable. Chest radiograph showed an ill-defined cavitating mass in left lower zone. CT revealed a solitary pulmonary mass in the left lower lobe abutting the chest wall, with cavitation and irregular margins (Figs. 6a & b). Loculated pneumothorax was noted adjacent to the lesion. There was no mediastinal adenopathy. A provisional diagnosis of peripheral bronchogenic carcinoma was made. A CT-guided biopsy was done. The histopathological examination revealed granulomas which were suggestive of tuberculosis. The patient was started



**Fig. 8** Case 4. Axial CT images, taken with (a) mediastinal and (b) lung windows, show a central mass lesion (arrow) with distal consolidation/collapse and adjacent pleural effusion. Diagnosis was nocardiosis.

on antituberculous therapy and the follow-up CT after two months showed significant reduction in the size of the lesion (Figs. 7a & b).

#### Case 4

A 40-year-old woman had a history of cough and recurrent haemoptysis of three months duration. She presented with a clinical history of acute renal failure. Her immune status was normal. Chest radiograph showed consolidation in right lower zone, with few areas of lucencies. Noncontrast CT was done as the patient was in renal failure. CT showed a well-defined mass in the region of the right lower lobe bronchus (Figs. 8a & b). Distally, there was consolidation with pleural effusion. A diagnosis of central bronchogenic carcinoma was made. The patient underwent a bronchoscopic biopsy and the diagnosis was nocardiosis. The patient was put on trimethoprim-sulfamethoxazole combination for two months. Follow-up CT after two months showed almost complete resolution of the lesion.

#### DISCUSSION

Radiological features suggestive of lung cancer include parenchymal mass showing spiculated margins, microlobulations, thick-walled cavity, cavity showing nodular margins and chest wall invasion. However, these findings are nonspecific, and many other nonmalignant conditions, such as pulmonary infections, infarctions and abscesses, may have similar appearances.<sup>(6,7)</sup> Differentiation based on imaging findings alone would be challenging and a pathological diagnosis is necessary. In a large study of 2,908 patients who underwent biopsy with a presumed diagnosis of lung cancer, 37 (1.3%) of them were found

to have infections.<sup>(1)</sup> Fungal infection was the most common among them, accounting for 46% of the infections diagnosed. The study indicated that the incidence of pulmonary infections masquerading as cancer is very infrequent.

Actinomycosis is a fungal infection caused by the *Actinomyces* species, most commonly, *Actinomyces israelii*. The infection involves cervicofacial, abdominal, pelvic and thoracic regions. Thoracic involvement can be of either pulmonary or endobronchial origin.<sup>(8)</sup> It occurs from aspiration of oropharyngeal saprophytes into the lungs, especially in patients with poor oral hygiene. The most characteristic CT feature is a chronic airspace consolidation containing central low-attenuation areas, peripheral enhancement with adjacent pleural thickening.<sup>(9)</sup> The lesion may show cavitation and varying amounts of fibrosis, and may be associated with mediastinal or hilar adenopathy, bronchiectasis and pleural effusion. With this appearance, a necrotic lung cancer is an important differential diagnosis.<sup>(8)</sup> The condition has a good prognosis if it is diagnosed early and prompt treatment is initiated. The patient presented here did not have the classic appearances of actinomycosis and malignancy had to be kept as the first possibility.

Mucormycosis is an uncommon, often opportunistic, pulmonary infection caused by fungi of the class *Zygomycetes*, which includes *Mucor*, *Rhizopus*, and *Absidia*. They are commonly seen in patients with haematological malignancies, diabetes and other immunocompromised states.<sup>(10)</sup> Pulmonary infection is the second most common form after rhinocerebral involvement. The clinical features are nonspecific. The CT appearances may be in the form of wedge shaped consolidations, mass-like images, nodules,

pleural effusion, halo sign and cavitation; the upper lobes are most commonly involved.<sup>(10,11)</sup> It may be associated with mediastinal or hilar adenopathy, vascular invasion and extrapulmonary involvement.<sup>(10)</sup> Horner's syndrome is rarely seen.<sup>(12)</sup> In our patient, an absence of any predisposing features and the presence of upper lobe mass with involvement of brachial plexus, led us to the diagnosis of Pancoast tumour. This was proven on biopsy.

Pulmonary tuberculosis is very common in the Indian subcontinent. It has varied presentations which include tuberculoma, cavity, cicatrization, aspergilloma, bronchiectasis, pleural effusion, mediastinal adenopathy and end-stage lung destruction.<sup>(13)</sup> Tuberculomas are characteristically present in sizes of 0.5–4 cm, and have smooth well-defined walls. Calcification is seen in 20%–30% of cases.<sup>(13)</sup> Our patient had a mass measuring about 6 cm, with cavitation and irregular margins in the periphery of the left lower lobe. These findings are not very typical of tuberculoma.

Nocardiosis is a rare infection caused by the genus *Nocardia*, and pulmonary disease is most commonly caused by *Nocardia asteroides*.<sup>(3)</sup> Lungs are infected usually from the inhalation of *Nocardia* species present in the soil. They cause infections in immunocompromised hosts, and rarely affect healthy humans. Lungs are the predominant site of involvement, and the infection may spread haematogeneously to the central nervous system and skin. The most common radiographical feature is consolidation. A mass-like picture is seen in about 20% of them and commonly involves the upper lobes.<sup>(14)</sup> Cavitation may also occur. In an immunocompromised patient presenting with a mass, nocardiosis must be considered as a differential diagnosis. Isolation of the *Nocardia* species is difficult as it requires an incubation period of up to three weeks. Our patient had chronic renal failure, and *Nocardia asteroides* was isolated from the biopsy specimen. No malignant cells were seen.

In addition to the examples highlighted above, many other infections also have the appearance of a mass. When no malignant cells or cellular atypia are seen on a biopsy specimen, it has to be

evaluated for infectious agents capable of producing such imaging appearances in order to establish a confirmatory diagnosis. In conclusion, image-based diagnosis of these infections is not possible as they occur very infrequently and have clinical symptoms and imaging features that mimic a malignant diseases. However, a proper clinical history and examination may give some clue to the diagnosis. In most cases, the infectious nature of the disease will be discovered only upon a histological examination. One has to be vigilant about such infections, as instituting the proper and specific therapy would improve prognosis.

## REFERENCES

1. Rolston KV, Rodriguez S, Dholakia N, Whimbey E, Raad I. Pulmonary infections mimicking cancer: a retrospective, three-year review. *Support Care Cancer* 1997; 5:90-3.
2. Kathir K, Dennis C. Primary pulmonary botryomycosis: an important differential diagnosis for lung cancer. *Respirology* 2001; 6:347-50.
3. Nenoff P, Kellermann S, Borte G, et al. Pulmonary nocardiosis with cutaneous involvement mimicking a metastasizing lung carcinoma in a patient with chronic myelogenous leukemia. *Eur J Dermatol* 2000; 10:47-51.
4. Karakelides H, Aubry MC, Ryu JH. Cytomegalovirus pneumonia mimicking lung cancer in an immunocompetent host. *Mayo Clin Proc* 2003; 78:488-90.
5. Conant EF, Wechsler RJ. Actinomycosis and nocardiosis of the lung. *J Thorac Imaging* 1992; 7:75-84.
6. George CJ, Tazelaar HD, Swensen SJ, Ryu JH. Clinicoradiological features of pulmonary infarctions mimicking lung cancer. *Mayo Clin Proc* 2004; 79:895-8.
7. Runciman DM, Shepherd MC, Gaze MN. Lung abscesses mimicking multiple pulmonary metastases. *Clin Oncol (R Coll Radiol)* 1993; 5:317-8.
8. Kim TS, Han J, Koh WJ, et al. Thoracic actinomycosis: CT features with histopathologic correlation. *Am J Roentgenol* 2006; 186:225-31.
9. Cheon JE, Im JG, Kim MY. Thoracic actinomycosis: CT findings. *Radiology* 1998; 209:229-33.
10. McAdams HP, Rosado de Christenson M, Strollo DC, Patz EF. Pulmonary mucormycosis: radiologic findings in 32 cases. *Am J Roentgenol* 1997; 168:1541-8.
11. Jamadar DA, Kazerooni EA, Daly BD, White CS, Gross BH. Pulmonary zygomycosis: CT appearance. *J Comput Assist Tomogr* 1995; 19:733-8.
12. Kotoulas C, Psathakis K, Tsintiris K. Pulmonary mucormycosis presenting as Horner's syndrome. *Asian Cardiovasc Thorac Ann* 2006; 14:86-7.
13. Kim HY, Song KS, Goo JM. Thoracic sequelae and complications of tuberculosis. *Radiographics* 2001; 21:839-58.
14. Menéndez R, Cordero PJ, Santos M, Gobernado M, Marco V. Pulmonary infection with *Nocardia* species: a report of 10 cases and review. *Eur Respir J* 1997; 10:1542-6.