Pulmonary Scintigraphy in Fibrosing Mediastinitis Due to Histoplasmosis

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The pulmonary scintigraphic findings from four patients with fibrosing mediastinitis due to histoplasmosis are reported. The ventilation/perfusion (V/Q) mismatch mimicked pulmonary emboli. However, in these cases the chest radiographs and/or gallium-67 scintigraphy were abnormal, suggesting mediastinal or hilar disease. Awareness of the nonembolic conditions that can result in V/Q mismatches is important in the interpretation of lung scans.

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Fibrosing mediastinitis is an uncommon disease characterized by slowly progressive fibrosis and exuberant collagen formation within the mediastinum (*1*,*2*). It is generally considered a complication of histoplasmosis (*3*). Symptoms result from compression of mediastinal structures, especially the superior vena cava, pulmonary artery and veins, bronchi, and esophagus. Perfusion defects on Tc-99m MAA scans seen in fibrosing mediastinitis have been described (*2*,*4*).

In this report we describe four patients with V/Q mismatch in lung scans simulating pulmonary embolism. The mismatch, however, resulted from constriction of the pulmonary artery by a fibrosing mediastinitis due to histoplasmosis. The gallium-67 scan obtained in one patient revealed the mediastinal inflammatory masses. We believe awareness of this entity in the interpretation of V/Q scans is important, especially in geographic areas where histoplasmosis is prevalent.

CASE REPORTS

Case 1. A previously healthy, 15-year-old, black male was admitted to the hospital on May 13, 1979, with a 3-wk history of pleuritic chest pain, a ten-pound weight loss, fatigue, and a chest radiograph showing a left paratracheal mass. The intermediate PPD-S skin test, sputum smears, and cultures were negative for mycobacteria. A gel-diffusion test for histoplasmosis was positive. A presumptive diagnosis of acute pulmonary histoplasmosis was made and the patient was discharged to outpatient followup. In June 1979 histoplasmosis titers were positive at 1:64 for yeast phase and 1:128 for mycelial phase, with decrease in 2 wk to 1:32 and 1:64, respectively.

In August 1979 he was readmitted with intermittent fever, left anterior pleuritic chest pain, dyspnea on exertion, and nonproductive cough, progressive since May 1979. An arterial blood sample on room air revealed p_{O_2} 88 mm Hg, p_{CO_2} 39 mm Hg, and pH 7.48. A V/Q scan showed a relatively uniform distribution of xenon-133 throughout the lung fields without air-trapping during washout. Tc-99m MAA scans revealed absence of perfusion to the entire left upper lobe as well as to the superior segment of the right lower lobe. (Fig. 1.)

Gallium-67 scan (Fig. 2) revealed increased uptake in the known left hilar mass and also in the middle mediastinum extending to the right hilum, where the chest radiograph was normal.

A thoracotomy was performed. Pathologic examination of the

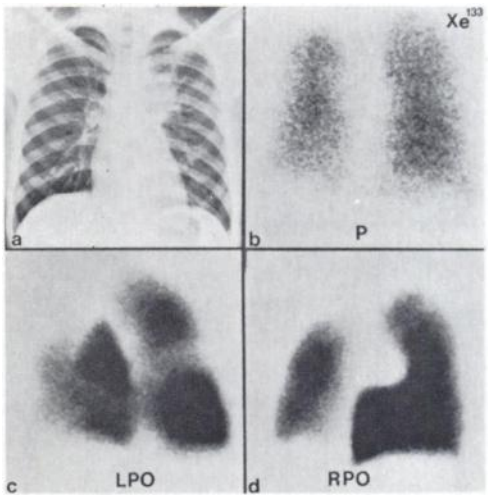

FIG. 1. Case 1. (a) Chest radiograph showing left paratracheal mass. (b) Posterior Xe-133 "first-breath" scan showing relatively uniform air distribution other than mild volume loss on left. No delay was seen in washout images. (c, d) Tc-MAA scans show unmatched perfusion defects.

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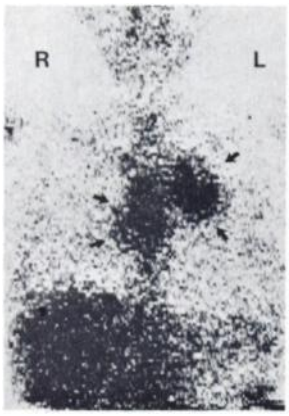

FIG. 2. Case 1. 24-hr Ga-67 scan showing intense uptake in bilateral hilar masses. (arrows). Right hilar lesion was not suspected on chest radiograph.

mediastinal mass showed findings consistent with fibrosing mediastinitis due to histoplasmosis. The patient improved subjectively without specific treatment.

Approximately 10 mo later, he presented with copious hemoptysis due to erosion of the bronchial artery to the left upper lobe. A pulmonary arteriogram revealed no evidence of pulmonary emboli but a complete occlusion of the left upper-lobe artery and severe constriction of the right upper-lobe artery due to extrinsic pressure.

Case 2. A 31-year-old, white, male medical entymologist was admitted to the hospital with a history of intermittent hemoptysis and right pleuritic chest pain. Five years earlier he had a bronchoscopy and thoracotomy, which demonstrated caseating granulomata in the right lower lobe and fibrosing mediastinitis. A histoplasmin skin test and complement-fixation titers were positive at that time. He had received amphotericin B over a 3-mo period, with resolution of symptoms.

At admission, chest radiographs revealed pleural thickening in the right hemithorax and loss of right-lung volume (Fig. 3a). Xenon-133 scans showed ventilation to both lungs, except that it was diminished in the right lower lung field and in a few scattered

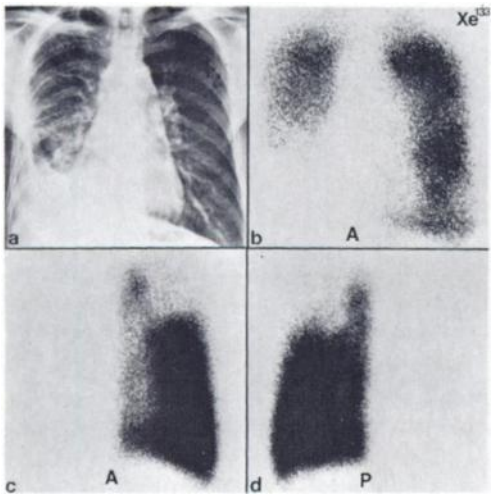

FIG. 3. Case 2. (a) Chest radiograph showing pleural thickening and loss of right-lung volume. (b) Anterior Xe-133 scan showing air distribution as in chest radiograph. There was no delay in washout images. (c, d) Tc-MAA scans show unmatched perfusion defects.

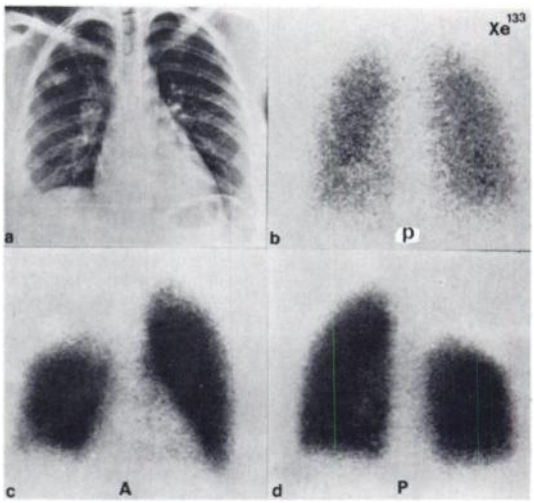

FIG. 4. Case 3. (a) Chest radiograph showing infiltrate in right upper lobe. (b) Posterior Xe-133 scan showing uniform distribution of air to both lungs. No evidence of air trapping was seen in washout images. (c, d) Tc-MAA scans show unmatched perfusion defect.

areas in the left lung (Fig. 3b). Tc-99m MAA scan showed a total absence of perfusion to the right lung and to the left apex (Figs. 3c and d). Tomograms of the hilum and mediastinum showed a calcified subcarinal mass compressing the right bronchus intermedius and the left mainstem bronchus. Bronchial biopsies showed only chronic inflammation. Fungal and mycobacterial stains and cultures were negative. Complement-fixation titers for histoplasmosis were positive at 1:8 in the mycelial phase and 1:32 in the yeast phase. Immunodiffusion studies revealed the presence of "M" bands but no "H" bands, implying previous but not currently active histoplasmosis.

Case 3. A 27-year-old, black woman was admitted to the hospital on April 19, 1977 with a history of pleuritic pain in the right scapular area. Three weeks earlier she had fever of 104°F, cough, questionable fullness of the right tracheobronchial angle on a radiograph, and negative intermediate PPD-S, with positive mumps.

The chest radiograph at admission showed a new right upper

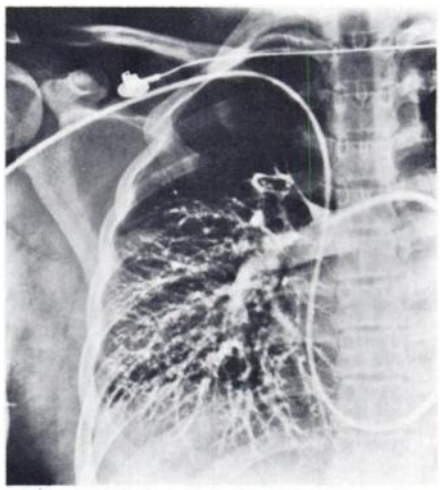

FIG. 5. Case 3. Pulmonary arteriogram showing external compression of pulmonary artery to right upper lobe.

lobe infiltrate and right hilar adenopathy (Fig. 4a). The lung scans revealed relatively uniform ventilation in both lung fields, but absent perfusion to the right upper lobe (Fig. 4b, c, and d). Her arterial p_{O_2} was 78 mm Hg and p_{CO_2} 39 mm Hg, with pH 7.39 on room air. Histoplasmosis titers from April 12, 1977 were 1:64 for yeast phase and 1:8 for mycelial, with a change to 1:128 and 1:16, respectively, on the second admission. This change was consistent with an acute histoplasmosis. A pulmonary arteriogram (Fig. 5) was performed, which showed no evidence of emboli but compression of the pulmonary artery to the right upper lobe by extrinsic pressure.

Case 4. A 36-year-old, black woman was admitted to the hospital with a 3-mo history of nonproductive cough, right chest pain, weight loss, and a persistent right paratracheal soft-tissue density on radiographs. The intermediate PPD-S tuberculin skin test was negative. Lung scans showed normal ventilation but decreased perfusion to the right upper lobe. Sputum smears and cultures were negative for fungi and mycobacteria. The histoplasmosis complement-fixation titers were 1:32 (yeast phase) and 1:8 (mycelial phase). A presumptive diagnosis of acute pulmonary histoplasmosis was made. She was discharged to outpatient followup.

One month later, right mediastinoscopy revealed evidence of mediastinal and hilar lymphadenopathy due to caseating granulomata and fungal forms consistent with histoplasmosis.

DISCUSSION

Infection with *Histoplasma capsulatum* is usually asymptomatic, and is far more prevalent than had been realized, involving an estimated 30 million Americans overall (*5*). An investigation during the histoplasmosis outbreak in Indianapolis revealed that 47% of students attending public high schools close to the sources had antibodies to *H. capsulatum* (*6*).

Fibrosing mediastinitis is postulated to develop after rupture into the mediastinum of the fibrocaseous material from mediastinal lymph nodes. An intense inflammatory reaction ensues, followed by fibrosis with entrapment of vital structures (*3*). Patients may present with cough, dyspnea, pleuritic pain, hemoptysis, and hypoxemia, which may mimic some of the manifestations of pulmonary emboli.

The probability of pulmonary emboli approaches 100% in patients with multiple large perfusion defects and normal ventilation (*7*). However, a host of uncommon or rare conditions may mimic the V/Q mismatch of pulmonary emboli, e.g., collagen vascular disease, tuberculosis, radiation fibrosis, pulmonary arterial-venous malformation, congenital pulmonary-artery stenosis, pulmonary veno-occlusive disease, mitral valve disease, bronchogenic carcinoma, sarcoidosis, pulmonary-artery sarcoma, right atrial myxoma (*8,9*), and fibrosing mediastinitis, as reported here.

In many of those diseases there may be clinical or radiographic clues that suggest the presence of a primary disease other than pulmonary emboli. Most of the cases with neoplastic or inflammatory processes show evidence of a hilar or mediastinal mass or parenchymal infiltrate on chest roentgenograms. Because of involvement of the central major vessels, the perfusion defects in these cases are generally few in number but are large, i.e., of an entire lobe or lung. By contrast, those due to pulmonary emboli are often multiple, segmental, and pleural based. Pulmonary tuberculosis and bronchogenic carcinoma commonly show ventilation as well as perfusion defects, although ventilation may be less compromised than perfusion. A fixed perfusion defect in followup scans favors a nonembolic process, whereas a changing perfusion pattern is commonly seen in acute pulmonary embolism (*10*).

Gallium-67 scans may be helpful in the differential diagnosis of the above conditions versus pulmonary embolism. Increased concentration of gallium-67 has been known to occur in nonembolic pulmonary diseases—e.g., lymphoma, tuberculosis, bronchogenic carcinoma, sarcoidosis, pulmonary-artery sarcoma (*11,12*), and pneumonitis—but not in pulmonary infarction (*13*). As Case 1 demonstrates, a gallium-67 scan of the chest may reveal an inflammatory mass in the mediastinum that is not apparent on radiographs but does cause a V/Q mismatch. Pulmonary angiography may be indicated in certain instances to disprove the presence of pulmonary emboli.

The reason for the normal ventilation scan in fibrosing mediastinitis, sarcoidosis, and other inflammatory or neoplastic process in the hilum or mediastinum is probably that the cartilagenous trachea and bronchi withstand the constricting process longer than the vasculature.

Fibrosing mediastinitis should be included in the differential diagnosis of nonembolic processes that can cause ventilation-perfusion mismatch.

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