ANALYSIS OF THE FISSURE SIGN

Raymond Gize, Miguel Dizon, and Fred Mishkin

Indiana University Medical Center, Indianapolis, Indiana

Initially, delineation of the interlobar fissures on the lung scan was associated with the peripheral hypoperfusion of microembolism (*1*), but more recent work suggests other causes for this phenomenon (*2–4*). A review of 295 consecutive lung scans revealed 188 were abnormal with demonstration of the fissure sign in 37 cases. The Anger camera was used in 18 cases and a dual-headed rectilinear scan-

Received April 26, 1971; original accepted June 14, 1971.

For reprints contact: Fred S. Mishkin, Martin Luther King, Jr. Hospital, 12021 Wilmington Ave., Los Angeles, Calif. 90059.

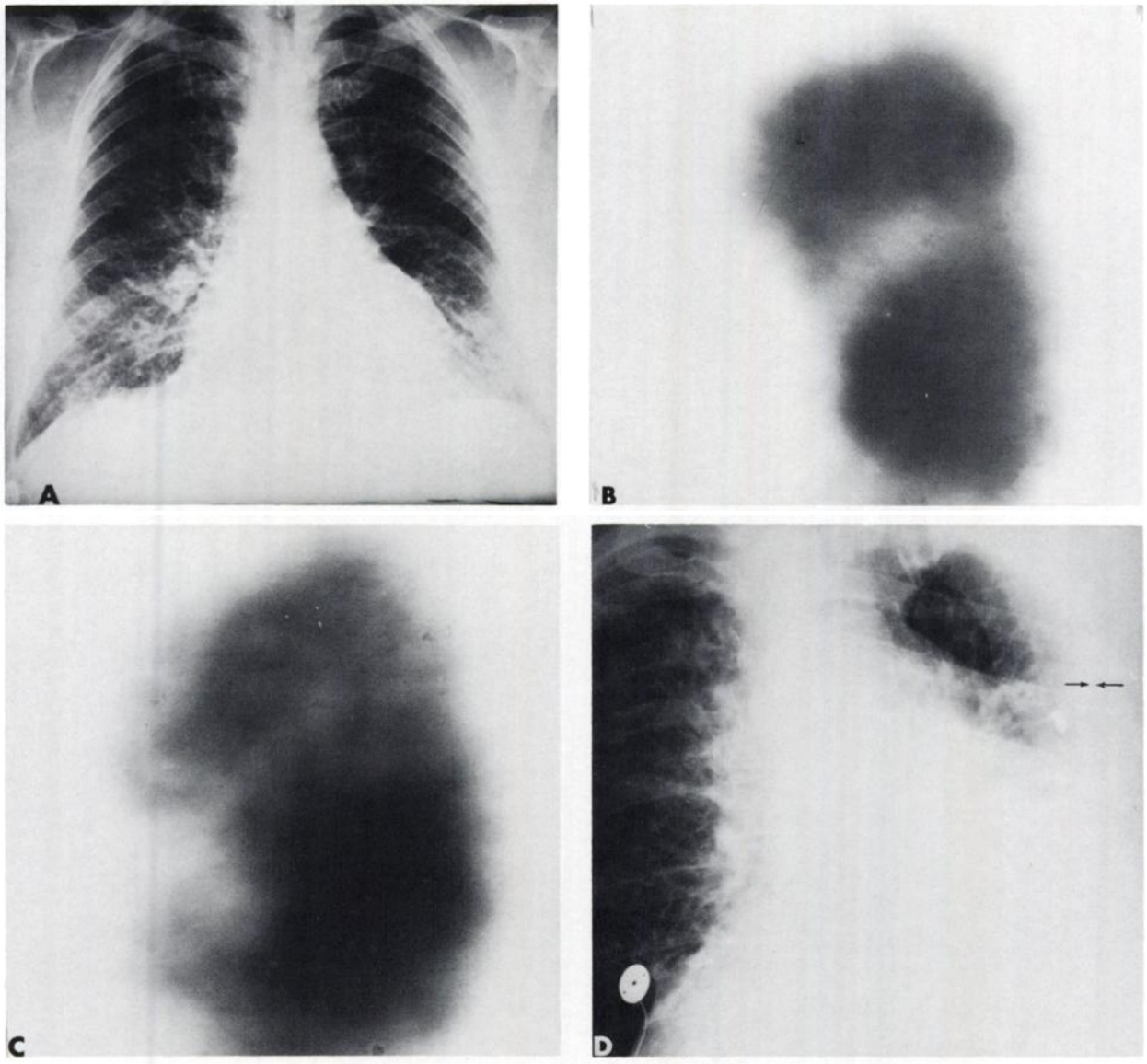

FIG. 1. Pleural fluid. 64-year-old man with history of recurrent myocardial infarct and congestive heart failure. Initial upright PA chest roentgenogram, A, showed no fluid. Left lateral scan performed with left side down and gamma camera head beneath patient demonstrates major fissure, B. Same lateral view performed with left side up and gamma camera head above patient does not demonstrate fissure, C. Following scan decubitus chest roentgenogram, D, shows large amount of fluid in left pleural space.

ner in 19 cases. Analysis of the charts and pertinent laboratory data of these patients was made to determine the cause for this lung-scan abnormality.

In 12 cases the dependent lung image recorded by the under-the-patient probe showed the fissures. When this same side was scanned in the superior position using the top probe, the fissure was not demonstrated. In these cases pleural fluid was present even though in some cases the upright chest film showed no fluid (Fig. 1). The scan findings reflect the fact that sufficient pleural fluid will displace the lung parenchyma at the time of scanning (*5,6*). Free pleural fluid accumulates in the fissures when the lung is dependent, displacing the lobes from one another. A disappearing fissure reflects drainage of free pleural fluid from the interlobar fissures toward the dependent mediastinum when the imaged lung is up. Lateral scans obtained with the Anger camera are generally obtained with the imaged side up, and therefore they do not demonstrate free pleural fluid.

It has been shown that large emboli may in time fragment and distribute peripherally (*7*). The scintigraphic pattern therefore depends upon when the scan is obtained during the course of pulmonary embolic disease. The fissure sign, along with evidence of major emboli on the lung scan, was demonstrated in 15 cases in which either the Anger camera or the upper probe of the rectilinear scanner was used (Fig. 2). Pulmonary angiography, clinical data, and autopsy verified the diagnosis of pulmonary embolism in these cases. Three cases showed the fissure sign during resolution of major embolization (Fig. 3). Clinical data supported the diagnosis of microemboli in seven cases (Fig. 4).

Xenon washout studies, pulmonary function studies, and clinical data did not support the diagnosis of pulmonary emboli but did support the diagnosis of volume loss and chronic obstructive lung disease in three cases (Fig. 5).

SUMMARY

Demonstration of interlobar fissures was present in 19% of the abnormal lung scans. Delineation of

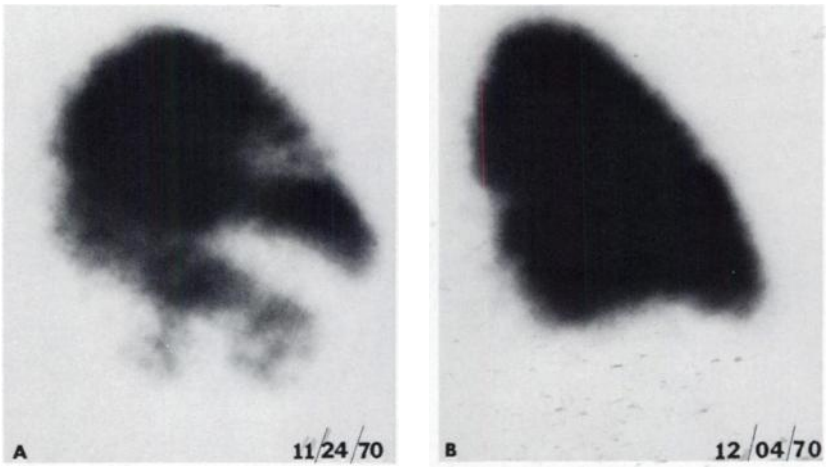

FIG. 2. Segmental embolism. 50-year-old man with arteriosclerotic heart disease, diabetes mellitus, and congestive heart failure developed tachypnea and tachycardia. Initial right lateral view, A, demonstrates multiple perfusion defects with an accompanying fissure sign. Followup right lateral view, B, demonstrates marked improvement of perfusion. Both images were performed with right side up.

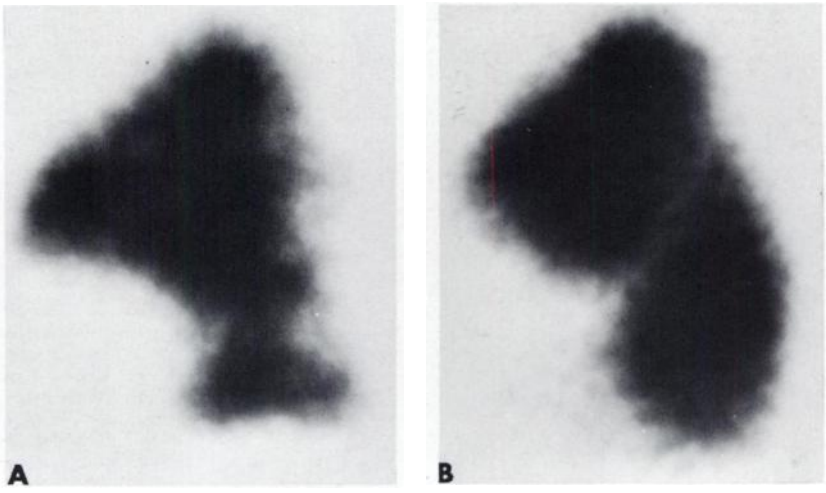

FIG. 3. Resolution of emboli. 56-year-old man admitted with acute myocardial infarction and congestive heart failure. Patient developed pleuritic chest pain with tachypnea and tachycardia. Initial left lateral view, A, demonstrates multiple perfusion defects with followup left lateral view, B, seven weeks later demonstrating major fissure. Both images were performed with left side up.

FIG. 4. Microembolism. 42-year-old, gravida 15, para 14, admitted for vaginal bleeding and inevitable abortion. Patient was treated for acute cor pulmonale secondary to recurrent microemboli and for congestive heart failure four months previously. Total abdominal hysterectomy and inferior vena caval ligation were performed at that time. Right lateral view with right side up demonstrates major and minor fissures on right with segmental perfusion defect in anterior segment of upper lobe (arrow).

the fissure was dependent upon the type of equipment used as well as the position of the patient at the time of imaging. The fissures were demonstrated in order of decreasing frequency associated with major emboli, pleural effusion, probable microemboli, and lobar volume loss.

REFERENCES

1. EATON SR, JAMES AF, POTSAID MS, et al: Scintigraphic findings in pulmonary microembolism. *Amer J Roentgen* 106: 778–786, 1969

2. CHANDLER HL: In discussion in "Embolic disease of the lung". In *Pulmonary Investigation with Radionuclides.* Gilson AJ, Smoak WM, eds, Springfield, Ill, Charles C Thomas, 1970, p 356

3. CHAUDHURI TK, GO R, VAN ROEKEL GW, et al: The fissure sign in lung scintigram: its relation to the positioning of the patient in differentiating true perfusion defect from fluid in the pleural cavity. *J Nucl Med* 11: 624, 1970

4. JAMES AE, CONWAY JJ, CHANG CH, et al: The fissure sign: its multiple causes. *Amer J Roentgen* 111: 492–500, 1971

5. PARTLOW WF, MCCORMACK KR: Changes in lung scan pattern related to free fluid and cardiac position. *J Nucl Med* 12: 2–4, 1971

6. MISHKIN FS, BRASHEAR RE: An experimental study of the effects of free pleural fluid on the lung scan. *Radiology* 97: 283–287, 1970

7. FLEISCHNER F: Roentgenology of the pulmonary infarct. *Seminars in Roentgen* 2: 61–75, 1967

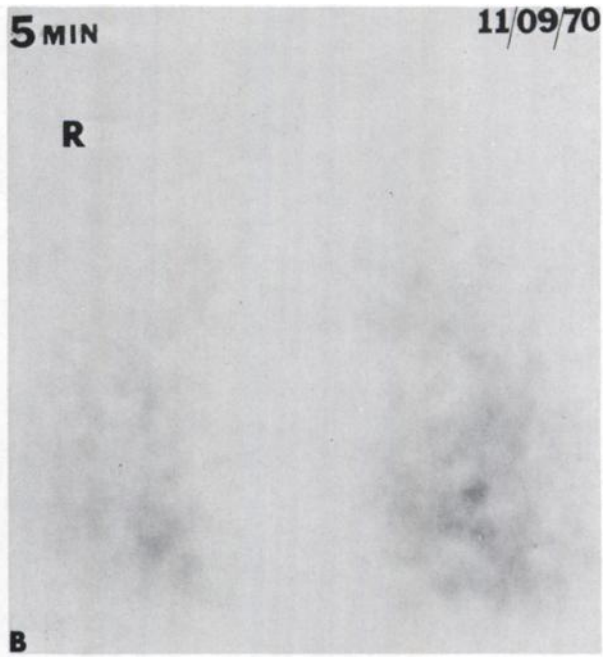

FIG. 5. Obstructive lung disease. 58-year-old man with 20-year history of dust exposure as brick cleaner. Pulmonary function studies revealed obstructive lung disease unresponsive to bronchodilators. Catheterization study revealed normal pulmonary wedge pressure and pulmonary hypertension. Left lateral image with gamma camera, A, demonstrates perfusion defect in lower lobe as well as major fissure. Five minutes after injection of ^{133}Xe, B, activity fails to washout of lower lung fields. Trapping is more prominent on left.