EFFECT OF PLEURAL FLUID ON THE APPEARANCE OF THE LUNG SCAN

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A 55-year-old man was admitted to the hospital with the tentative diagnosis of pulmonary embolism. He had had no chest pains or shortness of breath but was found on physical examination to have a right-sided pleural effusion. A supine chest radiograph (Fig. 1A) and a posterior lung scan (Fig. 1B) were obtained with the patient lying in the supine position. There was a marked decrease in activity of the entire right lung. Although the clinical picture was not that of pulmonary embolism, an arteriogram was performed (Fig. 2). No abnormalities of the vessels were *seen* (*1*).

It was believed that the decreased radioactivity in the right lung when the injection was made with the patient supine was due to the effect of pleural fluid. When the lung scan was repeated with injection of the labeled particles while the patient was in an upright position, the distribution of blood flow was normal except for the right lower lung field (Fig. 3). Figure 4 is the posterior-anterior chest roentgenogram showing the patient upright. A normal lung scan was obtained two days later after the patient had been treated with mercurial diuretics.

COMMENT

Lung scans of 225 patients during the 6-month period from January 1 through June 30, 1966, were reviewed. The injections of the labeled particles and scans were performed using a posterior detector with the patients in the supine position. Ten patients with unilateral pleural effusion from causes other than pulmonary embolism were found. The pattern of the lung scans was similar to that of the patient illustrated in this report. Six patients had effusion in the right pleural space and four in the left. The scanning patterns were similar whether the effusion was on the right or on the left. In contrast, patients who had equal bilateral effusion had symmetrical distribution of the radioactivity.

The pattern of distribution of free pleural fluid has been studied by Fleischner (*2*). More recently, Trackler and Brinker (*3*) have advocated the use of

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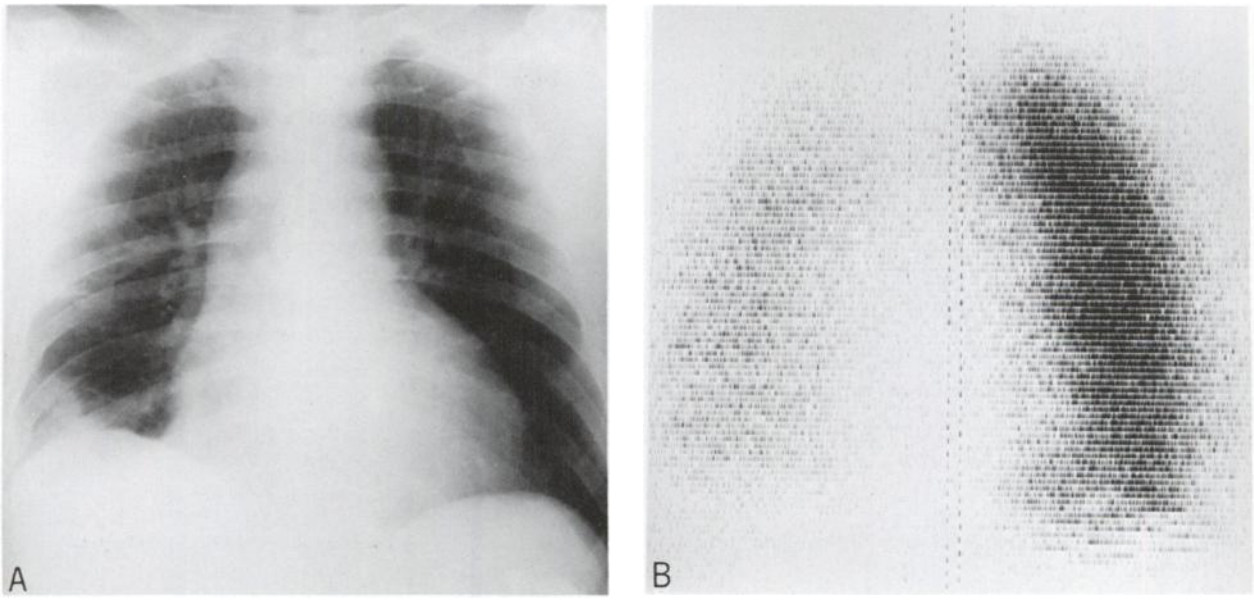

FIG. 1. A is supine AP roentgenogram: accumulation of fluid on right obscures costophrenic angle and lies partly in minor fissure. B is posterior lung scan showing decreased perfusion to right lung. Particles were injected with patient supine.

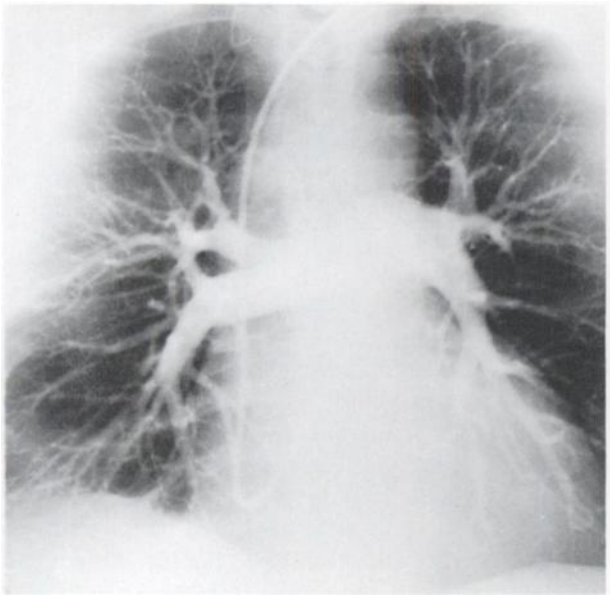

FIG. 2. Pulmonary arteriogram.

FIG. 3. Repeat posterior scan following injection of particles with patient upright.

supine chest roentgenograms as an aid to the early diagnosis of pleural effusion (*3*). In their analysis, 100 consecutive cases of pleural effusion were seen by chest roentgenograms; they found a shift of fluid when the posture was changed from upright to supine. In the upright posture, the paraspinal linear shadow is in the normal position in relation to the thoracic spine and descending aorta. On an overexposed anterior-posterior radiograph of the chest with the patient supine, this line is widened from

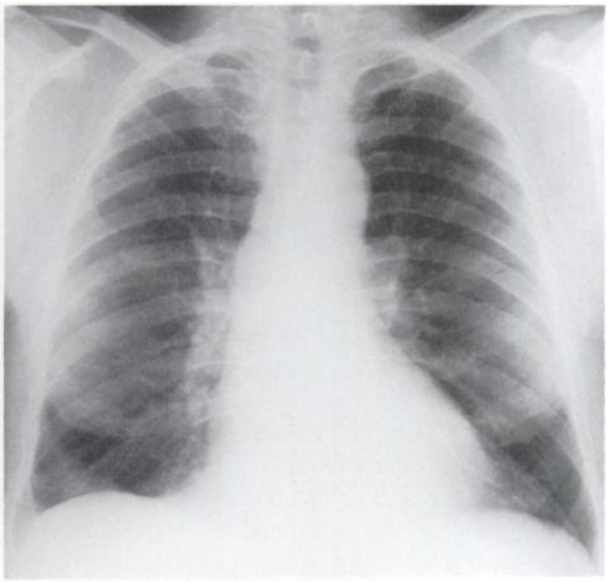

FIG. 4. Upright PA chest roentgenogram obtained at time second scan was done. There is haziness in right costophrenic angle indicating presence of pleural fluid.

relocation of fluid in the pleural space adjacent the mediastinum, the dependent portion of the lung in the supine posture.

The distribution of the pulmonary arterial blood flow as shown by the lung scan in the presence of unilateral pleural effusion during the supine posture can be the result of local mechanical compression on the blood vessels or absorption of the gamma photons, particularly with ^{99m}Tc. An increase in pressure in the pleural space is transmitted to the adjacent great vessels. This was demonstrated in dogs. In a low pressure system such as the pulmonary arterial circulation, small changes in vascular resistance can significantly affect blood flow.

In the presence of bilateral effusion of equal degree, the vascular resistance is the same in both lungs as is the absorption of gamma photons.

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