

LYMPHANGITIC CARCINOMATOSIS: LUNG SCAN ABNORMALITIES

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Lymphangitic carcinomatosis of the lung is a late and fatal manifestation of cancer. The diagnosis is seldom made ante mortem. Four patients with breast cancer had autopsy-proven lymphangitic metastases of the lung. Of these patients, two had normal chest x-rays and three had normal ventilation lung scans. The perfusion lung scans of all four showed irregular peripheral perfusion defects. Autopsies showed permeation of the lymphatics by tumor and tumor emboli in small arteries and arterioles.

Lymphangitic carcinomatosis is characterized by the extensive permeation of pulmonary lymphatics with metastatic carcinoma (1). It is a late and distressing condition. The clinical diagnosis is usually suspected when the chest x-ray of a patient with a known malignancy shows a diffuse interstitial pattern (2,3). Antemortem diagnosis is uncommon, however, since many patients have either normal or atypical chest x-ray findings (4). Antemortem diagnosis is essential if appropriate therapy is to be considered. Treatment of diffuse pulmonary metastases has improved the quality and duration of life (5).

This report describes the abnormal lung scan pattern in patients subsequently proven at autopsy to

have lymphangitic metastasis from breast carcinoma. The nonspecific scan findings, usually interpreted as pulmonary emboli, could lead physicians away from the true diagnosis.

MATERIALS AND METHODS

Between 1967 and 1974, a review of the tumor registry files of 265 patients who died from breast carcinoma revealed four cases of autopsy-proven lymphangitic carcinomatosis where chest x-rays and perfusion lung scans were taken within 2 months of death. Three patients had had ventilation lung scans. The clinical, chest x-ray, lung scan, and autopsy findings are the basis for this report (Table 1).

CASE REPORTS

Case 1. A 31-year-old woman had a modified radical mastectomy on Aug. 3, 1973, for Stage-I breast carcinoma. On Jan. 5, 1974, she developed chest-wall recurrence and a malignant pericardial effusion. She then had a bilateral oophorectomy, and also a pericardial window and instillation of intra-

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TABLE 1. CLINICAL, X-RAY, SCANNING, AND AUTOPSY FINDINGS

Patient No.	Chest x-ray	Perfusion lung scan	Ventilation lung scan	Lymphangitic metastases	Arterial tumor emboli
1	Normal	Abnormal	Normal	Extensive	Extensive
2	Normal	Abnormal	None	Extensive	Extensive
3	Interstitial densities	Abnormal	Normal	Focal, parenchymal	None
4	Nodules (less than 1.5 cm)	Abnormal	Normal	Extensive	Extensive

pericardial Cytoxan. She was given systemic Cytoxan, 5-fluorouracil, methotrexate, prednisone, and triiodothyronine. On Feb. 10, 1975, she was admitted with dyspnea of 1 week's duration. Chest x-rays showed a possible enlargement of the pulmonary artery (Fig. 1). A perfusion lung scan with ^{99m}Tc -macroaggregated albumin showed extensive irregular peripheral perfusion defects throughout both lung fields (Figs. 2 and 3). A ^{133}Xe ventilation scan was normal. The arterial blood oxygen saturation was 78%, pO_2 42 mm Hg, pCO_2 33 mm Hg, and pH 7.47. Pulmonary function studies showed a severe restrictive condition with decreased vital capacity and decreased total lung capacity. She was placed on Coumadin. A repeat perfusion-ventilation lung scan on Feb. 20, 1975, was unchanged. She was then given adriamycin and vincristine. Her course was progressive and she died April 23, 1975. Gross

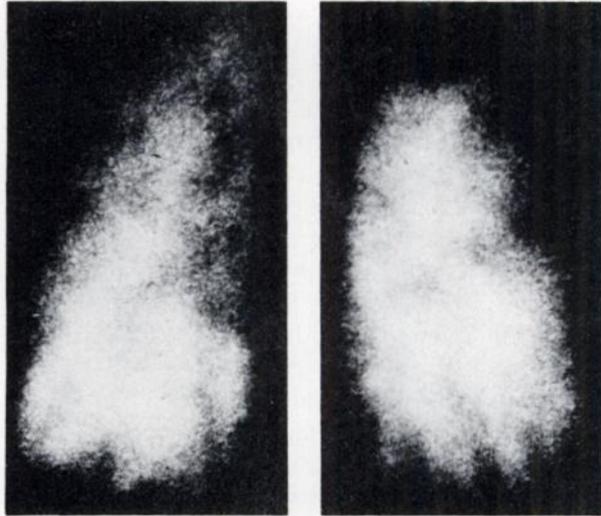


FIG. 3. Case 1. High-resolution perfusion lung scan amplifies defects shown in Fig. 2.

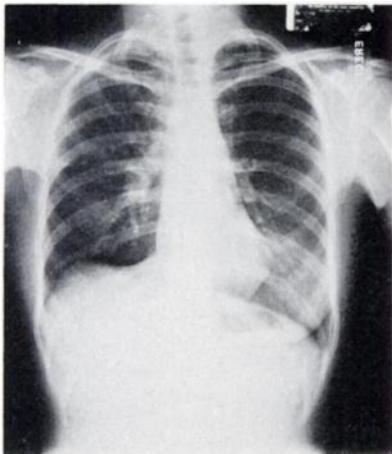


FIG. 1. Case 1. Chest x-ray shows slightly enlarged right hilar region.



FIG. 2. Case 1. Perfusion lung scan with ^{99m}Tc -macroaggregated albumin shows extensive irregular peripheral perfusion defects.

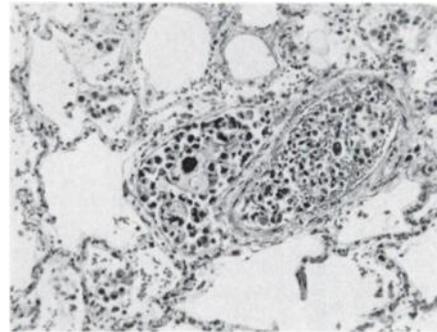


FIG. 4. Case 1. Microphotograph shows tumor with arterial thrombus and tumor in surrounding lymphatics ($\times 5$).

autopsy findings showed string-like areas of induration and thickened bronchial walls. Several tumor nodules, up to 1.5 cm in size, were found in both lungs. Histology showed extensive tumor deposits in small arteries and lymphatics (Fig. 4).

Case 2. A 73-year-old woman had a modified radical mastectomy on Aug. 7, 1972, for Stage-II breast carcinoma. On May 15, 1973, she was admitted with dyspnea and cyanosis of 1 month's duration. The chest x-ray was normal. A perfusion lung scan with ^{99m}Tc -macroaggregated albumin showed numerous defects consistent with emboli. The arterial blood oxygen saturation was 80%, pO_2 42 mm Hg, pCO_2 32 mm Hg, and pH 7.45. She died May 15, 1973, the day of admission. Gross autopsy findings suggested possible thrombi in small peripheral arteries. There was one discrete tumor nodule, 1.3 cm in size. Histology showed extensive tumor deposits in many small arteries and lymphatics.

Case 3. A 46-year-old woman had a right radical mastectomy on Oct. 21, 1971, for Stage-II breast carcinoma. On March 13, 1972, a chest x-ray showed numerous pulmonary metastases. A bilateral oophorectomy was followed by transient improvement. On Sept. 14, 1973, the chest x-ray showed diffuse interstitial and nodular infiltrates. A perfusion lung scan with ^{99m}Tc -macroaggregated albumin showed numerous defects consistent with emboli. A ^{133}Xe ventilation scan was normal. She was given 1500 rads irradiation to the whole of both lungs. After transient subjective improvement, she died Nov. 24, 1973. Gross autopsy findings showed diffuse fibrosis and partially organized pneumonitis. Histology showed numerous small foci of lymphangitic spread. No tumor emboli were observed in the arteries. The perfusion defects noted on the lung scan were presumably related to areas of pneumonitis and fibrosis with localized hypoxia and shunting through those regions.

Case 4. A 76-year-old woman had a radical mastectomy on July 2, 1970, for Stage-II carcinoma of the breast. She was admitted on May 22, 1974, with dyspnea and cough. Chest x-ray showed numerous nodules. A perfusion lung scan with ^{99m}Tc -macroaggregated albumin showed numerous defects. A ^{133}Xe ventilation scan was normal. Arterial blood oxygen saturation was 83%, pO_2 52 mm Hg, pCO_2 24.2 mm Hg, and pH 7.49. She was given a combination of Cytosan, 5-fluorouracil, methotrexate, and prednisone. Repeat perfusion-ventilation lung scans on May 3, 1974, were unchanged. She died July 1, 1974. Gross autopsy findings showed questionable areas of consolidation. Histology showed many arteries to contain nests of tumor cells within organized thrombi. There was extensive lymphangitic spread.

DISCUSSION

Lymphangitic carcinomatosis is a fairly common autopsy finding. The condition is usually not diagnosed antemortem (3). A correct diagnosis could lead to therapeutic measures that might achieve some improvement and prolongation of life.

Critical to antemortem diagnosis have been the chest x-ray findings. Unfortunately, the interstitial pattern characteristic of lymphangitic metastasis may not be present; indeed, the chest x-ray may appear normal (6). Pulmonary function studies may be sug-

gestive: severely restricted function with decreased vital capacity and total lung capacity (7). Arterial blood pO_2 is low.

Perfusion-ventilation lung scans may help raise the suspicion of lymphangitic carcinomatosis. In our patients, the perfusion lung scans showed irregular peripheral defects, while the ventilation scans were normal. The abnormal perfusion patterns are non-specific, however, and were initially thought to indicate pulmonary emboli (8). The same findings have been reported in a patient with widespread pulmonary lymphatic occlusion by tumor and also in patients with pulmonary microemboli (9,10). Our patients usually had both.

Autopsies showed permeation of the pulmonary lymphatics with metastatic cancer. With one exception (Case 3), small arteries and arterioles were occluded by tumor. The term "lymphangitic carcinomatosis" overlooks the frequently associated feature of tumor microemboli (1).

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