at the time of injection to be useful in some cases, but misleading in others with lateral or anterior lesions. We have continued to obtain such data to evaluate equality of renal perfusion and the vascularity of posterior mass lesions, but for most patients who demonstrate a mass lesion with glucoheptonate scintigraphy, we perform a subsequent perfusion study with pertechnetate using the view and collimator that best demonstrate the lesion and its blood flow. The images demonstrated by Dr. Kawamura did not differ from those seen with glucoheptonate. We disagree with his inference that the early uptake reflects the cortical nature of the lesion. This same "early" uptake is seen with glucoheptonate and pertechnetate and is a reflection of the vascularity of the lesion rather than its site of origin.

Finally, our point regarding incidental findings and the IVU was in regard to lesions that would not demonstrate scintigraphic abnormalities. Certainly the radionuclide study may demonstrate certain incidental abnormalities, such as those mentioned by Dr. Wolfstein, but none of the patients in this report had additional findings on either study.

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Lung-Scan Abnormality in Pulmonary Artery Branch Stenosis

Pulmonary artery branch stenosis is characterized by narrowed segments of one or more of the peripheral branches of the pulmonary artery. It is believed to be a congenital condition whose clinical course varies, depending on the severity of frequently associated cardiac anomalies, although the stenosis itself may give rise to pulmonary hypertension and right-heart failure. The diagnosis is suspected on the basis of the auscultatory findings and is confirmed by pulmonary-artery pressure tracings and/or angiography. The clinical, hemodynamic, and radiographic features of pulmonary artery branch stenosis have been well described in the literature (1-4).

We report a case of this condition, documented by pulmonary angiography, in which lung scanning revealed multiple segmental perfusion defects with normal ventilation, thus mimicking pulmonary emboli. The scintigraphic abnormalities were unchanged 4 mo later.

A 30-year-old black woman experienced nonpleuritic chest pain associated with dyspnea. Physical examination was unremarkable except for a systolic precordial murmur, widely transmitted to the axillae, the right supraclavicular area, and the back. The intensity of the murmur increased on deep inspiration. Electrocardiogram was normal. Chest roentgenogram revealed prominence of the
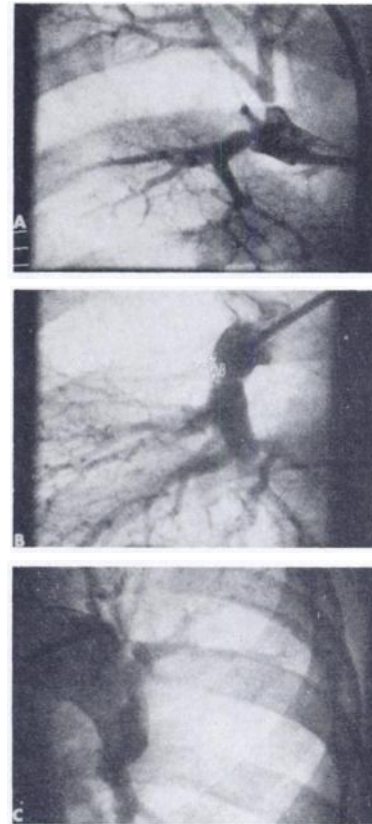

FIG. 2. Selective pulmonary angiogram. (A) Superior branch of right pulmonary artery reveals stenotic lesions in all of its three branches. (B) Inferior branch of right pulmonary artery shows stenotic lesion in inferior division itself. (C) Left pulmonary artery injection shows dilatation proximal to stenotic branches.

pulmonary outflow tract and slightly elevated left dome of the diaphragm. Arterial blood gases on ambient air were P_{O_2} 94, P_{CO_2} 35, and pH 7.43.

Perfusion lung scan with Tc-99m-labeled albumin microspheres revealed multiple defects—wedge-shaped, pleura-based and segmentally located—in both lung fields (Fig. 1). A xenon-133 study demonstrated good ventilation of both lungs, with delayed washout only from the left upper lung field.

A right-heart cardiac catheterization was performed, with selective pulmonary angiography. The pressures (mm Hg) were: right atrium 5, right ventricle 38/2, main pulmonary artery 32/17, and pulmonary artery wedge 7. The oxygen saturations were: right atrium 73.6% and pulmonary artery 69.5%. Pulmonary angiogram
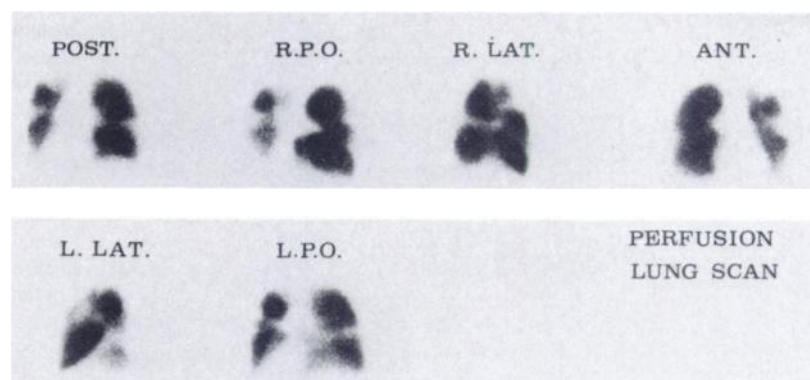
FIG. 1. Perfusion lung scan shows multiple, wedge-shaped, pleura-based perfusion defects in both lung fields.

and cineangiography revealed bilateral ring-type stenotic lesions in the branches of the lobar arteries (Fig. 2).

Introduction of the Xe-133 ventilation lung scan to complement the perfusion study has significantly increased the specificity of the latter in identifying pulmonary embolism. Areas of abnormal perfusion with preserved ventilation are highly suspicious for, but not pathognomonic of, embolic disease. Li et al. (5) recently listed 15 causes of "mismatch", including "congenital pulmonary vascular abnormalities", but examples of this last (6) described cases of unilateral pulmonary-artery abnormalities causing whole-lung ventilation-perfusion mismatch. Most of the other disorders on the list are uncommon and unlikely to be confused clinically with embolism. Furthermore, the perfusion pattern most characteristic of embolism—namely multiple wedge-shaped, pleura-based, segmentally situated defects—is extremely improbable in any of the listed conditions. Thus, when this particular perfusion pattern is seen in addition to a "mismatch", a diagnosis of embolism can be made with a degree of confidence approaching 100% (7).

Our case, then, differs from those previously recorded causes of "mismatch" in that the scintigraphic picture mimics one that is close to pathognomonic for embolism. This is because the hemodynamic features themselves are so similar to those of multiple emboli. The case also shows a lack of any significant ventilatory defect despite years of striking perfusion abnormalities. Pulmonary artery branch stenosis should be suspected as a cause for possible false-positive interpretation of embolism in patients with the typical auscultatory findings.

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The Role of Internal Mammary Lymphography in the Management of Breast Cancer

The knowledge of lymph-node involvement in the axillary region and also along the internal mammary lymph vessels is of greatest importance for the prognosis and management of breast carcinoma (1,2). Fletcher (3) and Munzenrider (4) have recently pointed out
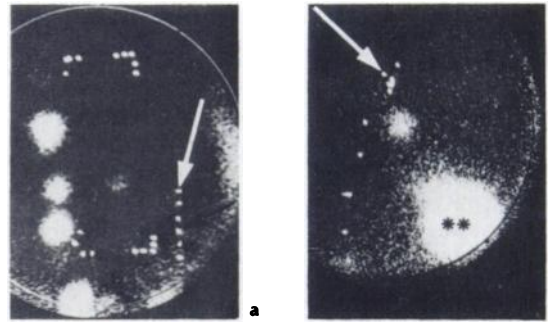

FIG. 1. Internal mammary lymph nodes visualized by orthogonal scintigram in cancer of left breast. a. Anterior view, made 6 hr after left-side and 3 hr after right-side injection of the microcolloid. Right chain is well visualized, but only one node is visible in the left chain. Rectangular mammary field is indicated and seems to cover left mammary chain. Arrow shows dots 1 cm apart. b. Another case of breast cancer. Left lateral view of thorax. Bright points show contour of anterior chest wall. Arrow indicates sternal notch (**: left intercostal deposit of microcolloid for axillar scintigraphy.)

the importance of correct irradiation of the internal mammary lymph nodes during the postoperative treatment of breast cancer.

Internal mammary lymphoscintigraphy (IMLS) is a simple, nontraumatic and reproducible technique for the visualization of the internal mammary lymph nodes (5).

The first contribution of IMLS is the evaluation of the degree of pathologic involvement of the internal mammary chains, though the interpretation of the scintigrams is not always without difficulties because the involved nodes are photon-deficient and there are normal anatomical variations in the lymph chain.

The second contribution of IMLS is the visualization of the lymph-node chain so that the irradiation field can be based on positive images, allowing good control of the treatment plan and its subsequent corrections (6).

In our own study, IMLS was performed in 71 cases in order to control the topographic correlation between the internal mammary chain and the postoperative irradiation field: either a simple "internal mammary field" or one established according to MacWhirter's technique. The patients were examined using a gamma camera, 3 and 6 hr after sequential injection of 400-600 μCi of Tc-99m-labeled microcolloid. A correction of the irradiation field was necessary in 45% of all cases after IMLS, because it was found that one or more of the visualized lymph nodes lay outside of the planned irradiation field (28%) or in a borderline position (17%).

The third contribution of IMLS is linked to the actual development of radiotherapeutic techniques: the tangential fields of postoperative breast-cancer irradiation are obtained using body contours determined by TCT scan and computer-calculated isodose curves. Figures 1 a and b show anterior and lateral IMLS views, with markers for the radiation port and the anterior body surface, and a series of 1-cm spaces for size. Figure 2 diagrams a plan for external radiation therapy. From the scintigrams the irradiation plan can be adjusted and the isodose curves calculated to deliver an efficient dose to the internal mammary nodes while at the same time minimizing the irradiation of lung tissues.

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