Even after the standard assessment criteria, including temporal changes, some of the perfusion studies were indeterminate. A xenon-133 ventilation study either could not be performed or was not helpful. When we applied our Criteria 2 more rigidly [positive test if: (a) lung scan indicates high probability of pulmonary embolus, or (b) if the emission venogram was positive in a patient with abnormal lung scan but indeterminate for pulmonary embolus], our data showed the expected directional change in sensitivity and specificity. Our criteria for the interpretation of emission venograms were also strict: (a) venous occlusion with or without collaterals; or (b) intraluminal defects only in ileofemoral segment, with stasis distal to the partially occluded segment. We agree that with the emission venogram alone and the criteria we used, the sensitivity of thrombus detection is going to be lower, but we feel that in the management of suspected pulmonary embolus, when there is no demonstrable abnormality in the ileofemoral segment, it is reassuring to believe that a major pulmonary embolus is unlikely.

We have followed these patients up to 3 yr, with repeat studies performed when indicated, and have observed (a) that pulmonary embolus patients with nonoccluding extensive thrombi in the ileofemoral segment have higher mortality; (b) that patients with documented ileofemoral thrombi had recurrent emboli, whereas emboli could not be documented by perfusion studies in subsequent episodes in those patients who initially had normal emission venograms that remained normal; and (c) that patients who on follow-up studies showed evidence of a continuing thrombotic process superimposed on chronic venous disease (collaterals and venous insufficiency) required anticoagulant therapy indefinitely to prevent emboli.

The study can be performed without significant additional radiation exposure, in a relatively short time, and a repeat study can be performed to demonstrate temporal changes. The fibrinogen uptake and emission venogram are complementary, but in the diagnosis and management of patients with pulmonary emboli we consider emphasis on follow-up study more helpful than adding another test.

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Pulmonary Hydatid Cyst Evidenced By Ga-67 Citrate Scan

Since the report of Edwards and Hayes (*1*), Ga-67 citrate has been widely used to locate neoplastic tissues. It has also successfully detected inflammatory lesions, particularly when an abscess is present (*2-4*). In the case to be described, it located an echinococcus cyst.

A 39-year-old white male presented with a 15-day history of progressive left-side thoracic pain, productive cough with blood-stained sputum, anorexia, and a 5-kg weight loss. Vital signs were normal. There was a mild temperature elevation (37.5°C), which subsided after 2 days in the hospital. Physical examination revealed a thin, well-oriented white male in moderate distress. There were no positive physical findings. The only abnormal laboratory data were ESR 86, Tyne test negative, Boyden test positive at 1:200 dilution, and numerous polymorphs in sputum on several analyses.

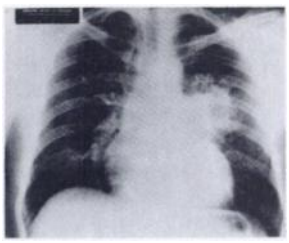

FIG. 1. (Left). Chest radiograph showing presence of 7-cm mass in parahilar region.

FIG. 2. (Right). Anterior gallium scan demonstrating circumscribed area of homogeneous uptake.

Chest radiographs showed a left anterior parahilar mass, 7 cm in diameter with irregular outline (Fig. 1). Bronchography was not performed because the patient was allergic to the contrast medium. Bronchoscopy revealed extrinsic compression of the left superior lobar bronchus without signs of wall infiltration or endobronchial mass. On the sixth hospital day, Ga-67 citrate was administered intravenously as a single dose of a 3 mCi. Scanning was carried out 48 and 72 hr later. A rectilinear scanner was used, equipped with a 3 in. NaI crystal and a coarse-focus 19-hole collimator. A window setting of 140-360 keV was used to encompass the two middle Ga-67 peaks. The scans showed an oval area of homogeneous uptake in the left anterior parahilar region, corresponding to the radiographic findings (Fig. 2). A left thoracotomy was performed on the tenth hospital day and a hydatid cyst with surrounding inflammatory tissue was excised. The pathology report described the cyst as completely enclosed by an area of marked inflammation. Polymorphonuclear leukocytes were especially abundant around the periphery within the pericystium and also within the perivesicular space, as shown in Fig. 3. The postoperative course was unremarkable, with discharge on the 25th hospital day.

The interpretation of circumscibed areas of high gallium uptake is often difficult. In particular, it is not always possible to differentiate between the two conditions in which positive gallium uptake is most common: neoplasm and abscess. Moreover, other radiologic and instrumental investigations, including invasive procedures, are not always diagnostic. Our patient's area of homogeneous uptake, more evident anteriorly, posed a difficult diagnostic problem. A neoplastic process was more likely since there were few clinical signs consistent with abscess. The operative finding of an echinococcus cyst was surprising, even considering the high incidence of hydatid disease in Sardinia. In fact, we almost ruled out the possibility of such a cyst because of the borderline positivity of the Boyden test, the absence of calcifications, and air-fluid levels

FIG. 3. Cyst wall is separated from pulmonary tissue by a thick fibrous capsule with marked inflammatory infiltration. H & E ×40.

on chest radiograph, the anterior rather than the more typical posterior localization, and the homogeneous uptake of gallium. We had not seen the last finding in 20 consecutive previous studies, all negative. The only possible explanation for this marked uptake and homogeneous appearance is the intense inflammation completely surrounding the cyst, with many PMNs. Gallium is known to bind preferentially to granulocytes and to be concentrated in lysosome-like granules (*5,6*). If only the periphery had been inflamed we would have expected the scan to show a ring-like configuration suggesting an abscess or a cyst. In our experience with this disease, frequent in Sardinia (*7*), inflammation of the extent observed in this case is exceptional, while a slight pericystic reaction is almost the rule.

Gallium, therefore, aside from its well-known uptake in neoplastic and inflammatory processes, can give "positive" imaging also in hydatid cyst if a considerable degree of inflammation is present. This finding may represent an important aspect of differential diagnosis in areas where hydatid disease is particularly common.

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Benign Angiofollicular Lymph Node Hyperplasia—Demonstration of Systemic Arterial Perfusion by Dynamic Lung Circulation Scintigraphy

Dynamic lung circulation scintigraphy (DLCS) with Tc-99m was used to visualize the relative pulmonary and bronchial arterial blood supplies of an unusual pulmonary lesion, benign angiofollicular lymph node hyperplasia, in a preoperative attempt to noninvasively rule out pulmonary vascular lesions. In an asymptomatic 17-year-old black female, chest radiograph demonstrated a 4 × 4 cm right hilar mass (Fig. 1). Skin tests for tuberculosis and fungus were negative as were sputum cultures and cytologies. Fluoroscopy revealed no changes in the mass with Valsalva or Mueller maneuvers. Linear tomography showed no evidence of calcification, cavitation, or deformity of the bronchi or pulmonary vessels.

After routine perfusion lung scanning with 1.0 mCi of Tc-99m macroaggregates of albumin, a bolus injection with 20 mCi of $^{99m}TcO_4^-$, followed by saline flush, was made into a left arm vein. Two-second sequential images were obtained with a scintillation camera. The data were also stored in a minicomputer system for correction of radioactivity contribution from the immediately preceding perfusion lung scan. Dynamic lung scintigraphy showed diminution of pulmonary arterial flow with a striking focal increase of radioactivity in the same region during systemic arterial flow (Fig. 2).

At thoracotomy a firm, smooth mass was found near the right hilum firmly adherent to the right middle and lower lobe bronchi. Multiple enlarged nodes were found in the peribronchial region adjacent to the mass. Histologic examination revealed benign angiofollicular lymph node hyperplasia.

First described by Castleman in 1954, benign angiofollicular lymph node hyperplasia is characterized by large inflammatory or reactive lymph nodes with many plasma cells (*1*). The nodes are highly vascular with evidence of capillary proliferation (*2*). Eighty-six percent of cases presented as hilar mediastinal masses (*3*). Some authors view these lesions as angiomatous hamartomas (*4,5*). Two histologic patterns are recognized (*3*), hyaline vascular (91%) and plasma cell (9%) types.

No definite clinical signs are present, however, a syndrome of fever, anemia, and hyperglobulinemia has been recognized with the plasma-cell type lesion (*3*). Radiographically the hyaline-vascular type lesions present as solitary round masses, whereas the plasma-cell lesions tend to be lobulated. They are usually located in the mediastinum or the hilum and show no calcifications. The differential diagnosis includes congenital or developmental lesions, infectious diseases with nodal involvement, neoplasms, and benign vascular lesions.

Since the bronchial arteries supply the bronchi, pulmonary vessels, visceral pleura, the mediastinal fascia, and the hilar lymph nodes (*6*), tumors involving these structures could demonstrate normal or increased supply during the systemic phase of DLCS. Selective bronchial arteriography has demonstrated abnormal vascularity in such pulmonary lesions as bronchogenic carcinoma, metastatic disease, long-standing pneumonias, and bronchiectasis (*6-8*). Marked systemic hypervascularity with hypertrophied mediastinal and bronchial arteries and dense homogeneous blush in the capillary phase have been demonstrated angiographically in benign angiofollicular lymph node hyperplasia (*9*). We have clinically observed that DLCS may show increased systemic blood supply in these diseases. Although DLCS does not provide a definitive diagnosis, it is a noninvasive means of ruling out pulmonary vascular lesions by demonstrating lack of perfusion during the pulmonary arterial phase and the increased perfusion during the

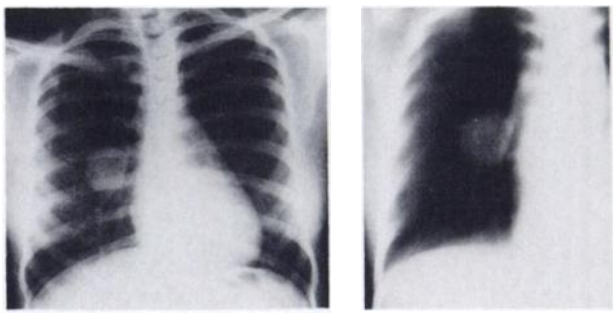

FIG. 1. Chest radiograph demonstrates right hilar mass (left). Linear tomography shows homogeneous mass with no deformity of bronchi or pulmonary vessels (right).