of the well-documented incidence of false-positive enzyme studies in the postaortocoronary bypass setting (presumably due to surgical trauma, hemolysis, renal insufficiency, etc.), bias against using enzyme levels as the sole criterion for POMI is in our opinion justified. Dr. Davidson does not point out that we also place equal bias against the use of a positive pyrophosphate scan as the sole criterion of POMI. Considering the demonstrated lack of sensitivity of the ECG and the nonspecificity of enzyme levels, we contend that our conclusion is valid and that of these three testing modalities, the pyrophosphate scan is the most valuable method to diagnose POMI.

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## Cardiopulmonary Flow Studies Show Venous Return From Upper Half of Body Passing Directly to Left Atrium

Cardiopulmonary blood flow studies with labeled microspheres may show intracardiac shunts between right and left cavities (*1*) when lungs and other organs dependent on the systemic circulation are visualized simultaneously. We had the opportunity to use such a dynamic sequence to detect an abnormal return of venous blood without any visualization of the lungs.

A 14-year-old boy was admitted to the Lyon Cardiovascular Hospital with a history of polycythemia and hypoxia. Three years before, he sustained successively two cerebral abscesses that required neurosurgery.

The pulmonary ventilation scintigram (Xe-133) was normal. After right antecubital intravenous administration of Tc-99m-labeled microspheres, serial scintiphotos of the thorax, recorded every 5 sec, revealed that all of the radioactivity seen first in the right "subclavian" vein was then found first in the left atrium, then in the left ventricle, and finally in the aorta. The lungs and the right cardiac cavities were never seen during this examination.

Subsequent scintiphotos centered first on the thorax, then on the abdomen, were performed. A thoracic picture realized at 1 min, only showed the thyroid gland. An abdominal picture taken at 2 min displayed radioactivity in the spleen, in the right kidney, and in a large diffuse left abdominal area (Fig. 1).

**FIG. 1.** Anterior view showing Tc-99m-labeled microspheres in spleen, right kidney, and in a large diffuse left abdominal area. Tracer was injected in right arm.

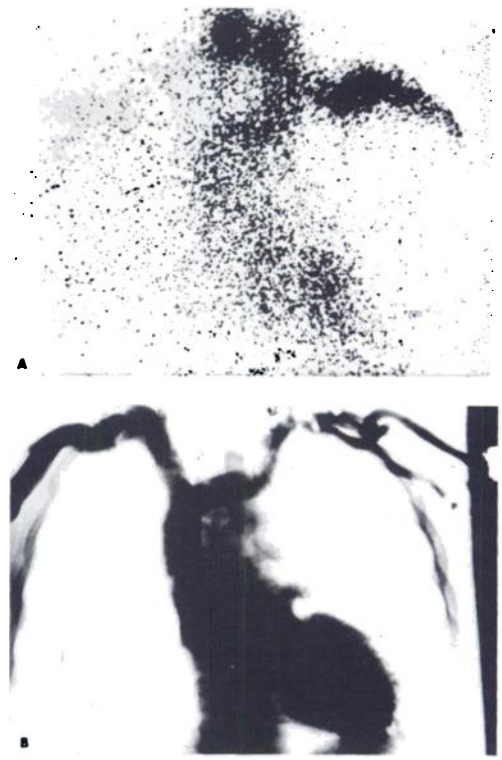

**FIG. 2.** (A) Scintigram after injection of tracer in left antecubital vein. Pattern of radioactivity is same as that observed after injection in right antecubital vein. (B) Contrast angiogram shows ending of superior vena cava in left atrium.

Next Tc-99m-labeled microspheres were injected i.v. in the left arm (Fig. 2A). The same results were observed.

The tracer was finally injected in a right foot vein. A normal lung scintigram was obtained.

This comprehensive scintigraphic study demonstrated that the venous return from the upper half of the body ended directly in the left atrium. Subsequent contrast angiography corroborated this malformation—that is to say, the ending of the superior vena cava in the left atrium (Fig. 2B). Three pulmonary veins ended in the left atrium, and the right superior pulmonary vein ended in the superior vena cava. The size of the right atrium was normal. Renal arteriography showed two normal kidneys.

The two scintigraphic images obtained after injection of microspheres, first in a right-arm vein, then in a left, clearly demonstrated, in a nontraumatic way, the return of venous blood from the upper half of the body directly to the left atrium. The lung image obtained after injection of the microspheres into a foot vein demonstrated that the inferior vena cava ended normally in the right atrium. The picture of the abdominal distribution of radioactivity after injection into an arm vein is more difficult to understand. We can eliminate the hypothesis of a situs inversus, since the abdominal aortic angiography performed before surgery displayed normal positions of liver and spleen. We thought that the microspheres were distributed according to the differential flow between the branches of the celiac trunk. The hepatic artery, being the smallest branch, received too few microspheres to visualize the liver. The large diffuse abdominal shadow was probably due to the flow of microspheres into the superior mesenteric artery. It remains difficult to explain the restriction of this diffuse area to the left part of the abdomen.

This type of vascular abnormality is seldom encountered. Kirsch (*2*), Tuchman (*3*), and Taussig (*4*) have described this anomalous drainage of the superior vena cava.

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## Xenon Ventilation Studies: Potential Use in Infants

The use of xenon-133 ventilation studies to aid in the diagnosis of pulmonary thromboembolus and chronic lung disease in adults has been accepted in many institutions. On two occasions we have been asked to perform neonatal xenon ventilation studies (*1,2*).

Case 1 is a neonatal female, weighing 3,572 g, the product of a term pregnancy. At delivery she was blue-gray in color, with a poor cry. Within a period of 3 hr, the color was pink and the baby cried actively. She was discharged from the hospital on the fifth postpartum day. She was readmitted to the hospital 13 days after birth, with difficult breathing and circumoral cyanosis. Initial physical examination showed an adequately developed female infant in minor respiratory distress. Respiratory rate was 52 per min, with short, panting respirations. Pulse rate was 152. The chest was symmetrical, with some substernal retraction. The breath sounds generally were decreased, with a few rales over both lung fields and occasional rhonchi. Examination of the extremities showed no cyanosis, clubbing, or swelling. A chest radiograph showed hazy infiltrate in the right upper lung field and a mediastinal shift to the right (Fig. 1). A bronchogram showed normal bronchi on the right. The left lung showed expansion in the left upper lobe, and a mediastinal shift to the right was present. The baby was treated with antibiotics after appropriate culturing. A xenon ventilation study using 10 mCi xenon-133 showed a large left-sided area of abnormal uptake, which persisted throughout the entire study (Fig. 2). A left upper lobectomy was performed. The left upper lobe was found markedly distended. Microscopic sections showed emphysematous lung tissue, with bronchial tissue deficient of cartilage. These changes are compatible with congenital lobar emphysema.


**FIG. 1.** Chest radiograph (Case 1) showing mediastinal shift and infiltrate in right chest.

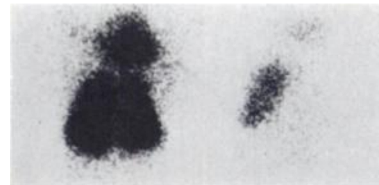

**FIG. 2.** Posterior views of infant xenon ventilation study (Case 1) with initial image at left showing bilateral normal filling. Image at right is at 100 sec, and shows clearing of radioactivity from right lung, but persistent activity in left lung.

The baby gradually regained strength postoperatively and within a short time showed no physical abnormalities.

Case 2 is a premature infant, female, at approximately 28 wk of gestation. She was delivered by Cesarean section, weighed 842 g, and showed the respiratory distress syndrome. The initial physical examination showed an active infant with endotracheal tube and arterial catheter in place. She was pink while 60% oxygen was being administered by respirator. There were no gross external anomalies. The chest gave raspy breath sounds bilaterally. There were no audible cardiac murmurs. The abdomen was soft with no masses or organ enlargment. Chest radiograph showed diffuse granular infiltrate with air bronchogram consistent with respiratory distress syndrome of the newborn (Fig. 3). Under suspicion of lobor emphysema, a ventilation study was performed using 10 mCi Xe-133. It showed diffuse air trapping bilaterally (Fig. 4).

The baby's condition gradually deteriorated and she died at 4 mo of age.

These two cases illustrate the potential use of xenon ventilation studies in infants. Two methods may be used. The first is for infants capable of independent breathing. This involves a lead-lined container enclosing a plastic bag with attached Xe-133 cartridge.* Approximately 2 feet of flexible tubing is used to attach a small unvented face mask and valve assembly to the air bag. The tubing

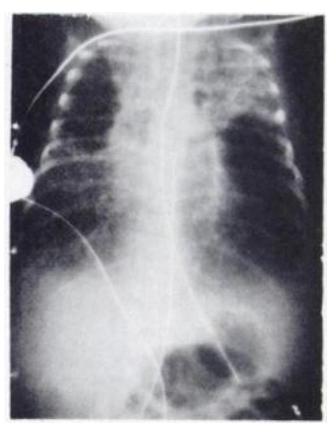

**FIG. 3.** Chest radiograph (Case 2) showing diffuse granular infiltrate.