Intralobar Sequestration*

Demonstration of Collateral Ventilation by Nuclear Lung Scan

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An intralobar pulmonary sequestration in the left lower lobe was studied before and after surgical excision. Ventilation scans showed delayed entry and subsequent trapping of radiogas in the area of sequestration. High pressure injection of barium sulfate in the left lower lobe bronchus, however, revealed no connection of the bronchial tree to the sequestration. The ventilation scan is a useful method to demonstrate collateral ventilation to a pulmonary sequestration.

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Work supported in part by a Pediatric Pulmonary Center grant from the Office of Maternal and Child Health Service, and a Care, Teaching, and Research Center grant from Cystic Fibrosis Foundation.
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Figure 1. Chest roentgenogram. Cystic-appearing structure in left lower lobe of lung.

Figure 2. 133Xe ventilation study (posterior view). Inhalation phase (left) shows area of absent radiogas uptake in left lower lobe.

Pulmonary sequestration is a cystic mass of non-functioning lung tissue without connection to the tracheobronchial tree. The sequestration receives its blood supply from an aberrant systemic artery. There are both intralobar and extralobar forms of pulmonary sequestration. As the names imply, the main difference between these two forms is that the extralobar sequestration has its own pleural covering.

Most authors state that there is no obvious connection between the sequestration and the tracheobronchial tree. There have been no adequate attempts to explain the cystic appearance of many sequestrations in spite of no apparent connections to the tracheobronchial tree.

We present a case of a cystic-appearing intralobar sequestration with demonstrated connections to the tracheobronchial tree. These connections are probably collateral ventilation channels. Pulmonary scintigraphy is one method of demonstrating these channels.

Case Report

An eight-year-old boy had dry cough and fever. Past medi-

Figure 3. Equilibration phase (anterior view) shows radiogas moved into this previously unventilated area.

Intralobar Sequestration (Hopkins, Levine, Waring)
The monia sideration of this syndrome is an apparent left lobe pneumonia. At six years of age, his recurrent respiratory infections were evaluated. Immunologic studies were unremarkable. Chest roentgenograms showed a left lower lobe density that was interpreted to be atelectasis. A perfusion lung scan demonstrated reduced perfusion to the left lower lobe. He was given symptomatic treatment for the next year, but continued to have a dry, hacking cough and recurrent fever.

At the time of this admission the patient was active and alert, with a recurrent, unproductive cough. Pertinent physical findings included rightward tracheal deviation, suppression of breath sounds and hyperresonance to percussion over the left lower lobe, and moderate digital clubbing. Hemogram, urinalysis, metabolic profile, and serum immunoglobulins were all normal. A chest roentgenogram (Fig 1) showed increased bronchovascular markings and an air-containing cystic structure in the left lower lobe. A perfusion lung scan using 99mTc demonstrated absent perfusion in a large portion of the left lower lobe. A 133Xe ventilation lung scan (Fig 2) showed absence of ventilation of the left lower lobe basal segments during the inhalation phase, with isotope appearing in these segments during the equilibration phase (Fig 3). A large area of radigas trapping in the left basal segments was demonstrated during the washout phase of the ventilation scan (Fig 4). Thoracic aortography revealed an aberrant artery traversing the diaphragm to supply an area in the base of the left lower lobe. An exploratory thoracotomy revealed a left lower lobe pulmonary mass. The mass and surrounding pulmonary parenchyma were excised and found to be an intralobar pulmonary sequestration. High-pressure barium sulfate injection of the bronchus leading to the excised pulmonary parenchyma showed no radiologic evidence of communication between the bronchus and the sequestration.

**DISCUSSION**

A diagnosis of pulmonary sequestration warrants consideration whenever the problems of recurrent pneumonia and atelectasis are investigated. This patient had a history of both recurrent pneumonia and a persistent air-containing cystic appearance of the left lower lobe. The diagnosis of pulmonary sequestration was suggested by chest roentgenogram and confirmed by aortography, surgery, and pathologic examination.

Two techniques suggested collateral ventilation of this sequestration. Injection of barium sulfate into the bronchus supplying the surrounding pulmonary parenchyma failed to show any direct bronchial connection between the tracheobronchial tree and the sequestration. This lack of direct communication was also demonstrated by the inhalation phase of the pulmonary scan. No isotope was seen in the area of the sequestration during this phase. However, isotope appeared in the area during the equilibration phase, and during the washout phase there was delayed emptying of isotope from the same area. In the absence of a direct bronchial route, radiogas was probably transferred from adjacent normal lung by collateral ventilation. Collateral ventilation of sequestrations was inferred by Culiner after examination of pathologic specimens. Nuclear scans are a more direct method of demonstrating this phenomenon.

Delayed clearance of isotope from an atelectatic or cystic area of lung that initially fails to take up isotope suggests collateral ventilation to that area. This information can help confirm the diagnosis of a suspected pulmonary sequestration.

**REFERENCES**