

**ABNORMAL PERFUSION AND VENTILATION**

**SCINTIGRAMS IN PATIENTS WITH AZYGOS FISSURES**

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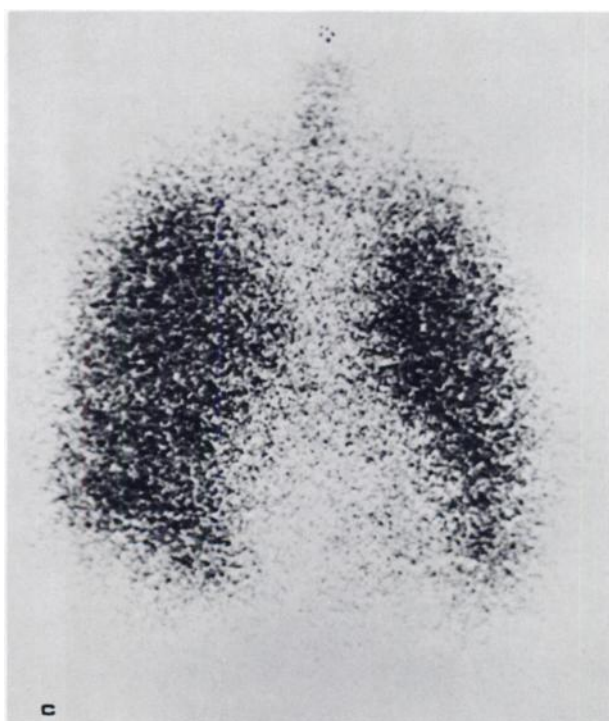
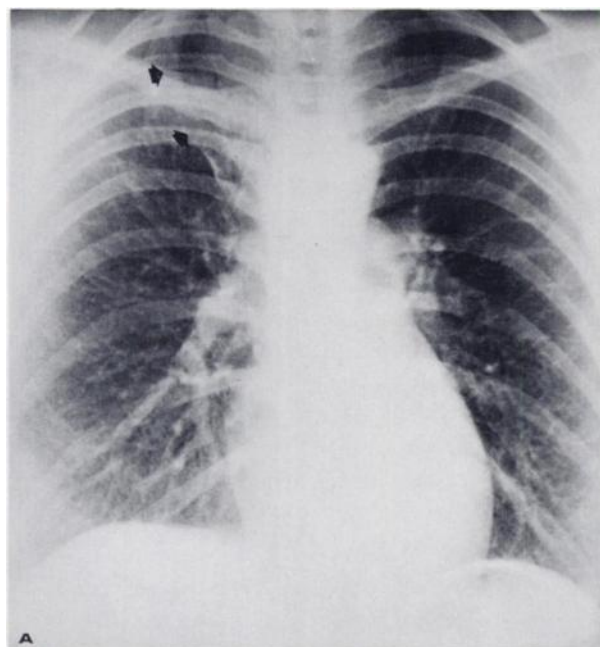
The occurrence of azygos fissures as detected by routine chest films varies from 0.4% (1) to 1.05% (2). Three patients with this anomaly demonstrated

superimposed diminution in both perfusion and ventilation of the azygos lobe by lung imaging. These studies are presented and discussed.

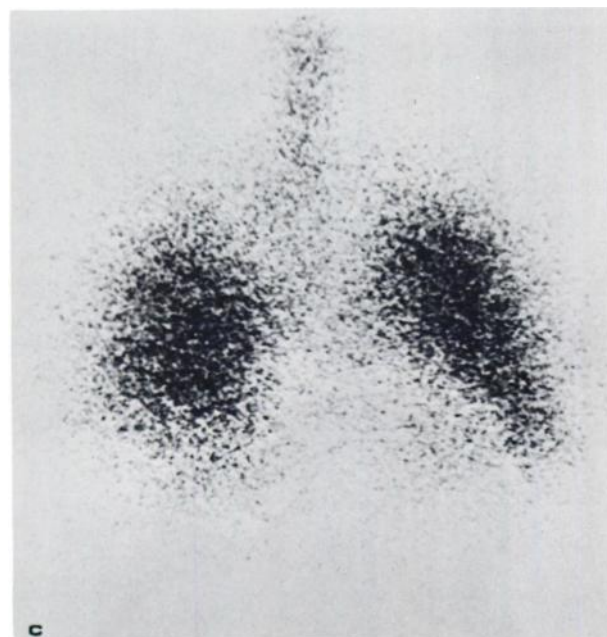
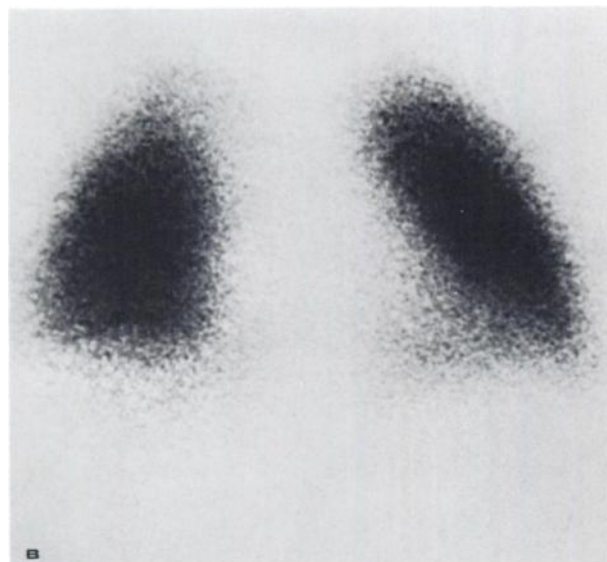
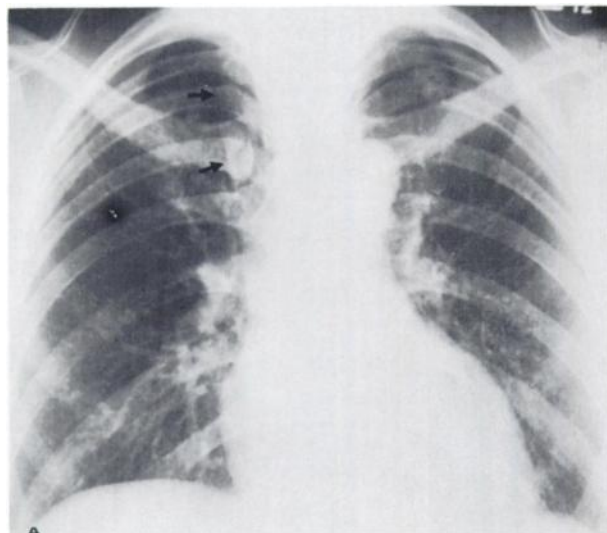
**CASE REPORTS**

**Case 1.** A 34-year-old woman was admitted to the Peter Bent Brigham Hospital for evaluation of intermittent left pleuritic chest pain of 3 weeks duration associated with possible recurrent left calf thrombophlebitis. Physical examination revealed ten-

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**FIG. 1.** Case 1. (A) Chest radiograph. Arrows indicate azygos fissure. (B) Perfusion scintigram (anterior). Diminished perfusion of medial portion of right upper lobe. (C) Ventilation scintigram (anterior). Diminished ventilation of medial portion of right upper lobe.



derness of the left calf with no erythema or edema. The patient was afebrile; laboratory studies including serum enzymatic activities and blood gases were normal. An electrocardiogram showed nonspecific ST-T wave changes in the precordial leads; the vectorcardiogram was normal. An azygos fissure was present in an otherwise normal chest film (Fig. 1A). Following the intravenous injection of 3.6 mCi of  $^{99m}\text{Tc}$  (as the iron hydroxide macroaggregate), gamma-camera image with the patient supine exhibited diminished perfusion of the medial portion of the right upper lobe with no other demonstrable abnormalities (Fig. 1B). A single breath inhalation study employing  $^{133}\text{Xe}$  revealed diminished ventilation of the same area (Fig. 1C). Final diagnoses were pleurodynia and resolving left calf thrombophlebitis. The patient was discharged asymptomatic.

**Case 2.** A 40-year-old woman with a nine-year history of diabetes insipidus and histiocytosis X was admitted for routine evaluation. She had no cardio-respiratory symptoms. Physical examination was unremarkable except for moderate obesity and several papular xanthomas in the right antecubital fossa. The chest roentgenogram showed a prominent azygos fissure (Fig. 2A). A pulmonary scintigram following the intravenous injection of 3.8 mCi of  $^{99m}\text{Tc}$  (as the iron hydroxide macroaggregate) with the patient supine revealed diminished perfusion of the medial aspect of the right upper lobe (Fig. 2B). After single breath inhalation of  $^{133}\text{Xe}$  decreased ventilation of this same area was also apparent (Fig. 2C). The patient was discharged following completion of endocrine and hematologic studies.

**Case 3.** A 60-year-old man was admitted for evaluation of an abnormal hematologic condition thought to be aleukemic leukemia. He also complained of mild fever, cough, fatigue, and dyspnea. Admission temperature was  $100^\circ$ . Rales were heard at the left base. Sputum grew D pneumonia. A chest x-ray showed a small left lower lobe infiltrate and an azygos fissure (Fig. 3A). Following the intravenous injection of 3.8 mCi of  $^{99m}\text{Tc}$  (as the iron hydroxide macroaggregate) gamma-camera imaging with the patient supine revealed decreased perfusion of the right upper lobe (Fig. 3B). A single breath  $^{133}\text{Xe}$  inhalation study revealed decreased ventilation of the same area (Fig. 3C). The patient's chest symptoms cleared shortly after treatment with Keflin was initiated. His underlying disease is felt to be a pre-

**FIG. 2.** Case 2. (A) Chest roentgenogram. Arrows denote azygos fissure. (B) Perfusion scintigram (anterior). Decreased perfusion of medial portion of right upper lobe. (C) Ventilation scintigram (anterior). Decreased ventilation of medial portion of right upper lobe.

leukemic state for which an appropriate chemotherapeutic regime has been started.

#### DISCUSSION

The azygos fissure arises from a downward invagination of the apical portion of the right upper lobe by an anomalous azygos vein which, with its mesenteriole and fold of parietal pleura, loops away from its normal position against the chest wall and vertebrae (3). Its pathological significance is the subject of dispute, although diseases that occur in other bronchopulmonary segments, such as pneumonia, bronchiectases, tuberculosis, and carcinoma may occur in the accessory lobe (4,5).

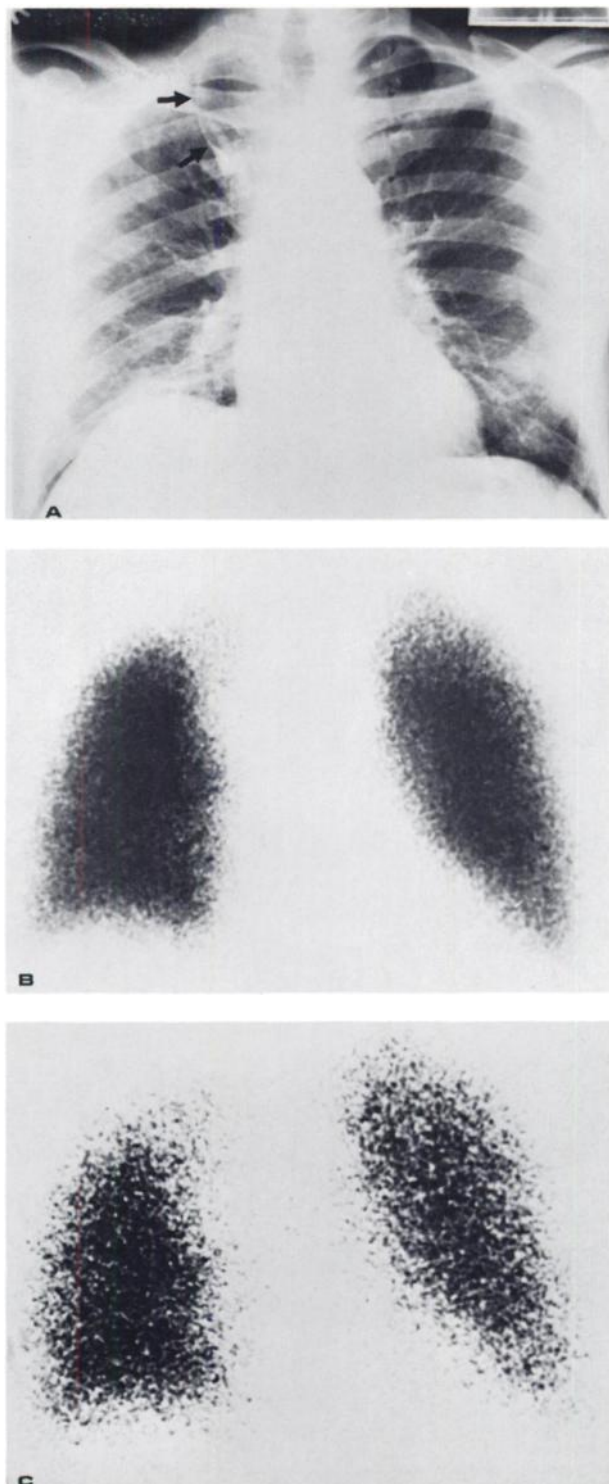
According to Boyden (6) the bronchial supply of the azygos lobe is somewhat variable: Either the apical (B<sup>1a</sup>) or the anterior (B<sup>1b</sup>) subsegmental branch of the apical bronchus is always present; in larger lobes, both these subsegments or the apical subsegments of the apical (B<sup>1a</sup>) and posterior (B<sup>3a</sup>) segmental bronchi may be present. The vascular supply is usually from the corresponding branches of the right pulmonary artery; there is rarely an independent bronchial blood supply (7,8).

The basis for the decreased perfusion and ventilation of the azygos lobe in these patients is not apparent, nor is it yet known whether this is a general property of the azygos lobe. Mechanical constriction of subsegmental bronchi may underlie a ventilatory deficiency. However, decreased trapping of the labeled macroaggregated particles implies local chronic abnormalities in either blood flow or particle extraction or both. The contribution of these abnormalities may be discerned by appropriate kinetic angiographic studies. This documentation of decreased perfusion and ventilation associated with the azygos fissure may partly explain why disease processes such as infection and tumor may be localized to the azygos lobe (4,8).

In addition, the studies here call attention to the azygos lobe as a possible cause of decreased right upper lobe perfusion in the absence of pulmonary embolism. The anatomic changes associated with the azygos fissure provide the basis for an additional condition to be considered in the differential diagnosis of pulmonary scintigraphic perfusion defects.

#### SUMMARY

Three cases of diminished perfusion and ventilation scintigrams are described associated with azygos fissures. These cases illustrate yet another distinctive cause of subsegmental perfusion defects not due to pulmonary embolism. Although the azygos fissure



**FIG. 3.** Case 3. (A) Chest radiograph. Arrows indicate azygos fissure. (B) Perfusion scintigram (anterior). Diminished perfusion of medial portion of right upper lobe. (C) Ventilation scintigram (anterior). Diminished ventilation of medial portion of right upper lobe.

has been considered to have no pathological significance, this evidence of diminished perfusion and ventilation suggests that the anomaly warrants re-evaluation as a cause of upper lobe disease.

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