Roentgenogram of the Month

Unilateral Air Trapping*

Y. Ohsaki, M.D., F.C.C.P.; S. Abe, M.D.; T. Yoshikawa, M.D.; and M. Murao, M.D., F.C.C.P.

A 36-year-old man was admitted for evaluation of general lassitude and productive cough. Past history revealed pulmonary tuberculosis at age 22, treated for nine months in a sanatorium. The patient was well until February, 1973, when he mistakenly inhaled kerosene. This was followed by fever and productive cough which disappeared in ten days. The patient inhaled kerosene again in 1975, resulting thereafter in the symptoms which necessitated hospital admission.

Physical examination revealed diminished breath sounds over the left lung with rales. Respiratory function tests revealed decrease of vital capacity (62 percent of predicted value), diffusing capacity for carbon monoxide of 15 ml/min/mm Hg (50 percent of predicted), and FEV1/FVC of 79 percent. Static compliance was 0.017 L/cm H2O. Inspiratory and expiratory chest films (Fig 1 and 2) were obtained.

*From the First Department of Medicine, Faculty of Medicine, Hokkaido University, Sapporo, Japan.
Reprint requests: Dr. Ohsaki, North 14, West 5, First Department of Medicine, Hokkaido University Faculty of Medicine, Sapporo, Japan 060
Diagnosis: Bronchial tuberculosis

Figure 1 shows discrete small nodular and linear shadows in the left upper lung field, possibly indicating old tuberculous infection. The left lung markings are diffusely diminished compared with the right side. On the expiratory film (Fig 2), the right lung is remarkably reduced in volume and the mediastinal structures are shifted to the right with crowding of the vessels in the right lower lung field. These findings indicated left-sided air trapping. A bronchogram (Fig 3) reveals an irregular stenotic wall of the left main bronchus. Bronchoscopic examination showed swelling and hyperemia with yellowish-white coating just distal to the carina. After bronchoscopy, the patient expectorated some purulent bloody sputum in which tubercle bacilli were detected.

Tuberculous involvement of bronchi is thought to occur in one of the following three ways:

1. Direct growth of tubercle bacilli in the bronchial mucosa, the organisms coming from cavitary lesions in the distal lung parenchyma.

2. Lymphatic spread. A lymph node surrounding a bronchus is infected by the primary lung lesion. The lymph node lesion progresses, involves the bronchial wall, finally ulcerating into the bronchial wall. New lung lesions may occur from spread to the distal lung parenchyma. This type of endobronchial tuberculosis is seen mainly in children.

3. Extension from a pulmonary lesion by direct infiltration, hematogenous spread, or primary infection of the bronchial mucosa.

Tuberculous endobronchitis is said to begin as a lesion on the posterior wall of the trachea or in a major bronchus. Simple erythematous changes with edema and round-cell infiltration progress to ulcer formation, which develops continuously despite therapy for the parenchymal disease, and resulting narrowing of the bronchi.

There are many causes of unilateral lung transradiancy. Unilateral hyperlucent lung, or Swyer-James or McLeod syndrome, usually results from diffuse bronchial damage due to an infectious process. Due to disturbance of ventilation, blood flow to the affected lung is diminished. These changes result in reduced size of the pulmonary arteries and hypoplasia of the lung.

Involvement of main or large bronchi by an endobronchial process, such as bronchogenic carcinoma or other neoplasm, could be the cause of trapped air distal to the lesion.

Air-trapping can be detected on an expiratory chest roentgenogram, a valuable roentgenographic procedure for detecting early endobronchial stenosis or obstruction. In our case, air trapping resulted from left main bronchial tuberculosis, which was infected by dissemination from a parenchymal tuberculous lesion.

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