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# Gastrointestinal Visualization During Xenon-133 Ventilation Study in a Patient with Tracheoesophageal Fistula

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A 37-yr-old female with H-type tracheoesophageal fistula demonstrated visualization of the gastrointestinal tract during a ventilation study using  $^{133}\text{Xe}$  gas. Gastrointestinal visualization by  $^{133}\text{Xe}$  on a ventilation study may prove to be a useful screening procedure for this condition in appropriate patients.

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**H**-type tracheoesophageal fistula is a rare congenital abnormality. Diagnosis of the fistula has been made by fluoroscopic studies with barium swallow. We report here an adult patient with this condition showing gastrointestinal visualization on a xenon-133 ( $^{133}\text{Xe}$ ) ventilation study made for evaluation of pulmonary function. The patient's tracheoesophageal fistula was accompanied by bronchiectasis. We present the interesting image and discuss the usefulness and limitations of ventilation scintigraphy in tracheoesophageal fistula.

## CASE REPORT

A 37-yr-old female consulted a physician complaining of cough and sputum. There was no past history of respiratory problems except for mild asthmatic attacks every autumn. In infancy, ingestion of milk had resulted in coughing. Ever since she can remember, she often choked on taking food although she had never developed pneumonia. These episodes were more apt to occur with swallowing of liquids than with solid foods. Approximately 1 mo prior to admission to our hospital, she spit up bloody sputum and sought medical advice at a nearby hospital. Bronchiectasia in the right upper lobe was suspected as the bleeding point.

Esophagogram with contrast medium was performed in our hospital, which revealed the influx of barium into the bronchial tree (Fig. 1A). Ventilation scintigraphy with  $^{133}\text{Xe}$  was

performed because there were pulmonary lesions which were thought to be a result of aspiration and a past history of bronchial asthma. On ventilation scintigraphic examination, the digestive tract was visualized with  $^{133}\text{Xe}$  on inhalation and during the washout phase (Fig. 1B).

A tracheoesophageal fistula (10 × 8 mm) was removed surgically, and the patient made an uneventful recovery.

## DISCUSSION

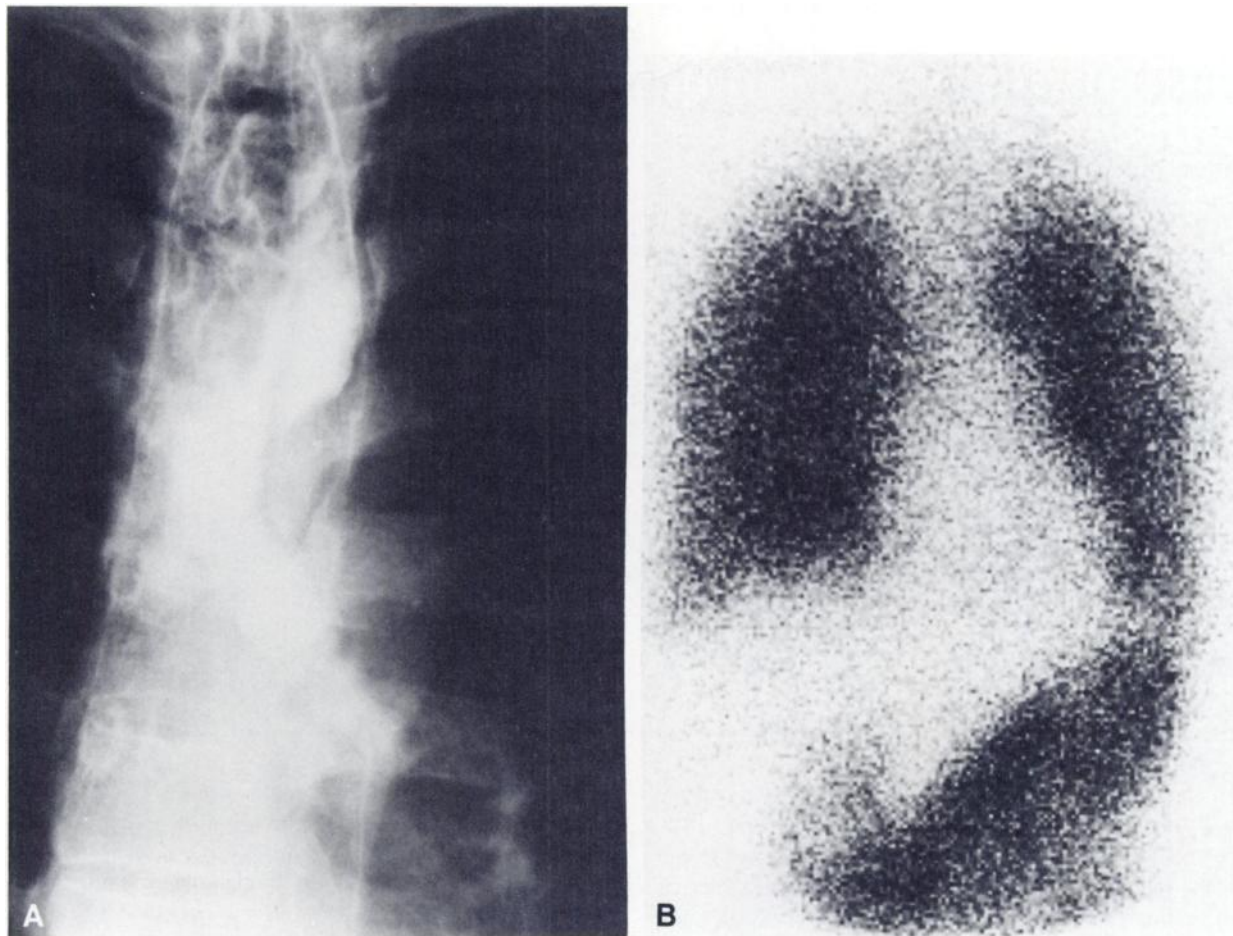
H-type tracheoesophageal fistula is a rare congenital anomaly (5% to 8%) (1). It can be found at infancy if the size of fistula is sufficiently large. It is unusual for a case to be unrecognized until adulthood as in this patient. Paroxysms of coughing precipitated by feeding is the most common symptom. Gaseous distention of the gastrointestinal tract and pneumonia are also frequently accompanied. As far as we know, ventilation scintigraphic imaging with visualization of the gastrointestinal tract, as shown in this case, has not been reported as a diagnostic measure for this disease, although there is a report of scintigraphy following a technetium-99m colloid swallow visualizing the trachea (2).

Bivins et al. measured the disappearance of  $^{133}\text{Xe}$  introduced through a catheter into the esophagus in dogs with artificially created tracheoesophageal fistula, and demonstrated the potential usefulness of this radionuclide in the diagnosis of the problem (2). Ventilation scintigraphy may be useful as a screening method in patients with acquired tracheoesophageal fistula caused by radiation therapy for esophageal cancer or malignant

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**FIGURE 1**  
 A: Barium showing the opacification of bronchial trees as well as the dilated esophagogram. B: Ventilation scintigram with <sup>133</sup>Xe in equilibrium phase well demonstrates the passaged radioactivity into the stomach.

tumor of the lung. This maneuver may also be adopted in the diagnosis of acquired tracheoesophageal fistula due to cuffed tracheal tubes (4). In such patients, upright position and barium injection may be quite difficult because of the patients' condition. Ventilation scintigram can be performed in a supine position and needs no injection of contrast medium that may adversely influence respiration.

Barium sulfate suspension is also a safe contrast medium if the test is performed with selective catheterization of the esophagus and utilization of small aliquots of barium sulfate. However, it is also reported that aspiration of barium suspension into the lung produces profound alteration in blood gases (5). Bronchographic contrast medium is not always an ideal contrast medium to demonstrate the tracheoesophageal fistula.

Ventilation scintigraphy is a noninvasive examination. Radionuclide can influx through a very small fistula into esophagus. Ventilation scintigraphy should

be a useful modality in screening for the presence of a tracheoesophageal fistula, although some attention must be taken to avoid false-positive diagnosis in infants with inability to cooperate with the procedure or aerophagic adults.

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