

Bronchopleural Fistula Mimicking Chronic Obstructive Lung Disease on ^{133}Xe Scan*

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A 56-y-old woman with a history of non-small cell lung cancer presented with a persistent left pneumothorax and a left bronchopleural fistula after bronchial balloon occlusion. A ventilation-perfusion scan using ^{133}Xe and $^{99\text{m}}\text{Tc}$ -macroaggregated albumin (MAA) was requested to evaluate for possible lung reduction surgery.

With 428.46 MBq (11.58 mCi) of ^{133}Xe gas, ventilation images were acquired in the posterior projection during a single breath-hold in the equilibrium and washout phases. Regions of interest were drawn around the lungs to generate ventilation time-activity curves. Then, 162.06 MBq (4.38 mCi) of $^{99\text{m}}\text{Tc}$ -MAA were injected intravenously and 8 standard projections of the lungs were acquired. Regions of interest were drawn around the lungs to calculate differential perfusion.

QUESTION 1

- [Fig. 1] Based on the ^{133}Xe ventilation and $^{99\text{m}}\text{Tc}$ -MAA perfusion images shown (Fig. 1), what is the best interpretation of this study?
- A. Chronic obstructive pulmonary disease.
 - B. Bronchopleural fistula.
 - C. Normal scan findings.
 - D. A or B.

QUESTION 2

What are the physical half-life and biologic half-life of ^{133}Xe , respectively?

- A. 30 min and 20 s.
- B. 2 d and 50 s.
- C. 5.3 d and 30 s.
- D. 7 d and 60 s.

- [Fig. 2] Correlative CT images of the chest are shown (Fig. 2).

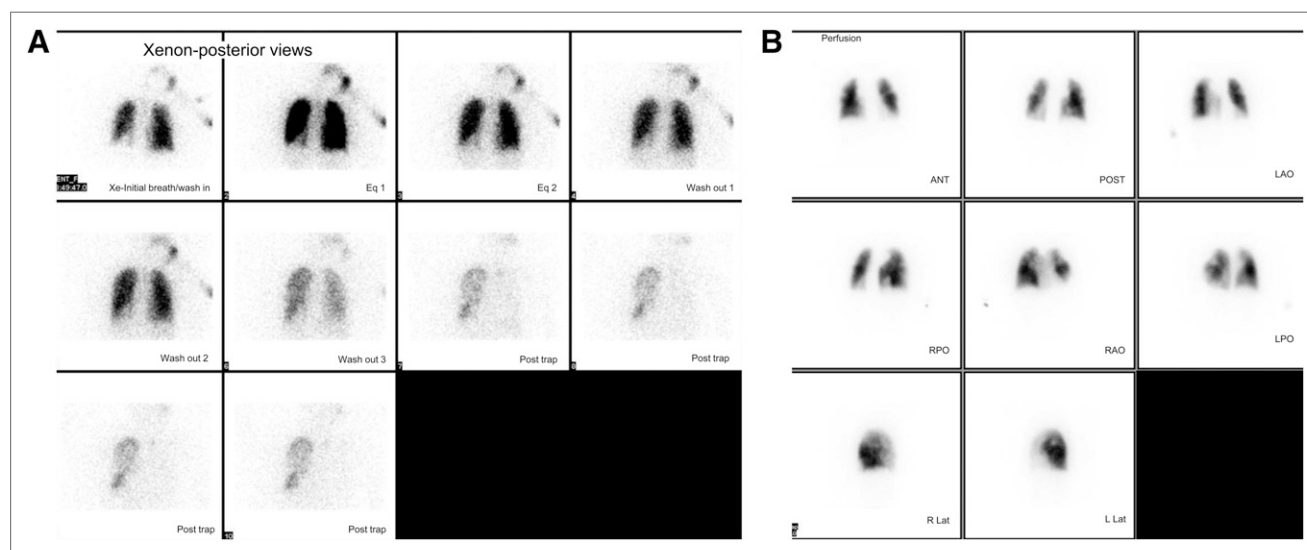


FIGURE 1. ^{133}Xe ventilation images (A) and $^{99\text{m}}\text{Tc}$ -MAA perfusion images (B).

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FIGURE 2. Correlative CT images of chest in cross-sectional (A) and coronal (B) views showing mild bilateral emphysema and large left-sided pneumothorax.

QUESTION 3

What are the CT imaging features of a bronchopleural fistula?

- A. Pneumothorax or air trapping on the side of the fistula.
- B. No abnormality on CT images.
- C. Return to midline of a previously shifted mediastinum or a drop in the fluid level by more than 2 cm in patients after pneumonectomy.
- D. A and C.

DISCUSSION

Bronchopleural fistula is a process that can be caused by several lung diseases or by injury. The most common causes are pulmonary infections, trauma, surgical complications, malignancy, and therapy of malignancy. Among various imaging techniques such as plain radiography, CT, ^{133}Xe scanning, and ultrasound, CT and ^{133}Xe scans are the most promising. CT is the anatomic imaging technique of choice for visualization and characterization of a bronchopleural fistula. Most authors recommend CT as the first diagnostic examination. ^{133}Xe ventilation scanning is a simple and accurate method for diagnosis and follow-up of bronchopleural fistula. ^{133}Xe images will show trapping of the tracer on the affected side during the washout phase. A study by Raja et al. in 1999 showed the sensitivity of ^{133}Xe to be 83% and that of $^{99\text{m}}\text{Tc-DTPA}$ to be 0% in the diagnosis of bronchopleural fistula. In this case, the ^{133}Xe scan findings can be seen in bronchopleural fistula as well as in chronic obstructive pulmonary disease. The distinction could be made by correlating with the history and CT imaging. According to the present literature, CT should be the first modality for the diagnosis and characterization of bronchopleural fistula, and ^{133}Xe scanning can be used as an inexpensive and simple follow-up imaging modality.

BIBLIOGRAPHY

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*For the answers, see page ■■■.

Answers to the Questions on Page ■■■

Question 1

Answer: D

- A. Tracer is trapped in the left lung during the washout phase of the ^{133}Xe ventilation images; the findings can be due to either severe chronic obstructive pulmonary disease or bronchopleural fistula.
- B. The findings can be due to either chronic obstructive pulmonary disease or bronchopleural fistula.
- C. The scan findings are abnormal because of trapping of the tracer during the washout phase of the ^{133}Xe ventilation scan.
- D. The findings can be due to either chronic obstructive pulmonary disease or bronchopleural fistula.

Question 2

Answer: C

^{133}Xe is a radioactive gas and rapidly clears from the body mostly by exhalation, with a biologic half-life of 30 s.

Question 3

Answer: D

CT is a helpful modality in visualizing a bronchopleural fistula. CT identifies the location, number, size, and etiology of the fistula. Communication between the airway and pleural space can be seen on thin-section CT. Other associated findings on CT can be lung consolidation, pneumothorax, and empyema or an air–fluid level in the pleural space.