

Unusual bilateral pneumothoraces due to the pleural window acting as a one-way valve

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Introduction

Simultaneous bilateral spontaneous pneumothoraces are relatively rare and only 1.3% of spontaneous pneumothorax cases are bilateral as well as simultaneous (1). We present a case of simultaneous bilateral pneumothoraces in a patient who followed a complicated course due to a pleuro-pleural communication.

Case presentation

A 70-year-old man presented with right chest pain. He had undergone surgery for esophageal cancer 11 years before via a right thoracic approach, and the esophagus was reconstructed using the stomach through a retrosternal route. A radiograph showed simultaneous bilateral pneumothoraces, with the pneumothorax being more severe on the left side than the right (*Figure 1*). A computed tomography (CT) scan revealed two bullae in the right lung and a bulla in the left lung. A chest tube was inserted into the left pleural space. Unexpectedly, both lungs were found to be fully expanded without performing a drainage procedure on the right side. Considering the existence of a pleuro-pleural communicating channel, we reviewed the CT scan and observed an air space in the mediastinum, which combined the bilateral pleural cavities (*Figure 2*).

Air leakage stopped two days after initiating pleural drainage, so the chest tube was clamped to know the side where the air leakage occurred. The following day, radiography indicated the presence of a small pneumothorax in the left side. After five hours of observation, the patient complained of dyspnea. At this time, a radiogram showed

left-side dominant bilateral pneumothoraces similar to the original pneumothoraces at the time of admission.

Based on the result of clamping and magnitude of each of the pneumothoraces, we assumed the origin of the pneumothoraces was the left lung and decided to perform surgery on the left side.

Before surgery, we inserted another chest tube in the right pleural cavity and unclamped the left chest tube. Interestingly, no air leakage was seen from the right chest tube. During the left-sided surgery, no bullae or lesions causing pneumothorax were detected in the left lung. However, we found a 5-mm pleural window between the descending aorta and the pericardium approximately 3 cm above the diaphragm through which the right thoracic cavity was seen (*Figure 3*). In addition, there were a few sheets of membranous structure in front of the pleural window, although the membranes did not completely close the pleural window. We finally closed the pleural window by direct suturing and completed the surgery.

After air leakage from the left pleural cavity stopped, air leakage from the right pleural cavity began and continued. Therefore, we performed a thoracotomy and bullectomy of the right lung, which stopped the air leakage from the right pleural cavity. We ultimately determined that the bilateral pneumothoraces occurred as follows: the ruptured bulla of the right lung created the right pneumothorax and the surplus air in the right pleural cavity entered the left pleural cavity through the pleural window, which then caused the formation of bilateral pneumothoraces.

Discussion

There have been several reports of simultaneous bilateral pneumothoraces caused by pleuro-pleural communication (2-8). In some of these reports, simultaneous bilateral pneumothoraces occurred in patients who had a history of

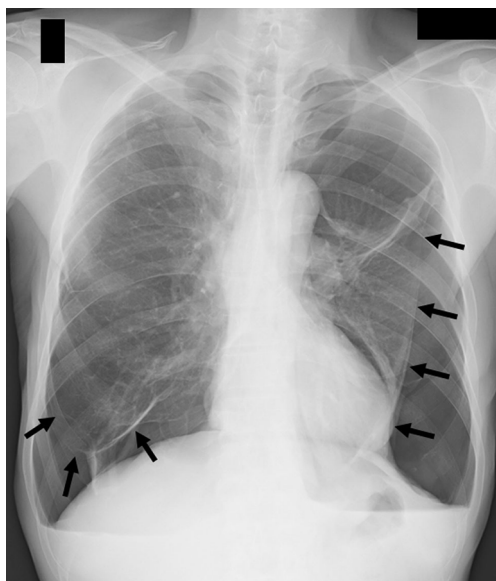


Figure 1 Chest radiograph on admission showing simultaneous bilateral pneumothoraces. Both of the lungs collapsed, as shown by the arrows. The pneumothorax was found to be more severe on the left side compared to the right.

esophagectomy using the stomach for reconstruction of the esophagus through a retrosternal route, as in the present case (2,7,8). However, none of these reported cases followed an unusual clinical course like our case did. In addition, our patient developed simultaneous bilateral pneumothoraces as long as 11 years after undergoing esophagectomy. This fact suggests that pleuro-pleural communication still remains even after such long period.

The pleural window might have functioned as a one-way valve that sent air from right to left, and not in the opposite direction. A one-way valve function of the pleural window could explain this unusual bilateral pneumothoraces. We found membranes on the left side of the pleural window in the CT image (*Figure 2*) and we also detected a membranous structure in front of the mediastinal pleural window during the first, left-sided surgery. These findings provided further confirmation of our hypothesis that the pleural window with a membranous structure functioned as a one-way valve.

In the present case, the origin of the pneumothoraces was likely the bulla in the right lung. Although the left pneumothorax was more severe than the right pneumothorax, the patient actually complained of right chest pain on admission. Ultimately, we should have given more importance to his chief complaint.

In summary, pleuro-pleural communication was determined to be the cause of simultaneous bilateral pneumothoraces in this case. When the communication

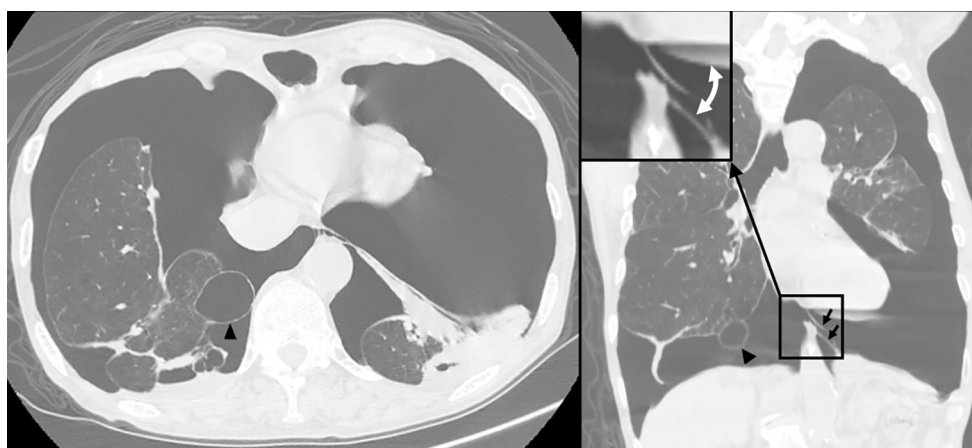


Figure 2 CT scan showing simultaneous bilateral pneumothoraces and a bulla in the right lower lobe (arrowhead), and bridging air space in the mediastinum, suggesting the presence of a pleural window connecting the two pleural cavities. The pleural window was shown in the coronal image more clearly than in the axial. There were membranes on the left side of the pleural window (arrows), and they might work like a flap, as shown by the double-headed arrow (square). CT, computed tomography.

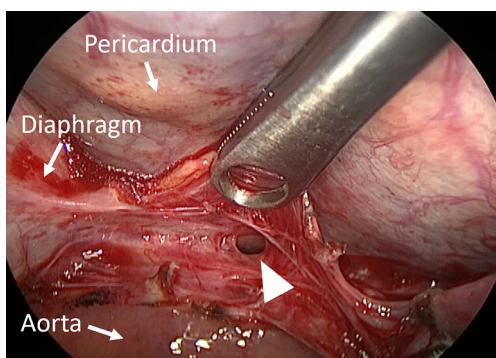


Figure 3 Intraoperative finding showing a 5 mm-long pleural window (arrow head) between the descending aorta and the pericardium about 3 cm above the diaphragm through which the right thoracic cavity was seen.

works as a one-way valve, it may be difficult to identify the origin of pneumothoraces. However, new knowledge from our report which mentioned for the first time pleuro-pleural communication acting as a one-way valve will help clinicians avoid potential complications of a compromised thorax.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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