

BILATERAL PNEUMOTHORAX IN LUNG METASTASES OF BREAST CARCINOMA: A CASE REPORT

Kusdjianto Amanda Yuanita^{1*}, Samsuri², Andri², Wijayanto Andi², Subiyantoro Agus³, Habibie Adi³

¹Faculty of Medicine, Universitas Brawijaya, Malang, East Java, Indonesia

²Pulmonology Departement, Wahidin Sudirohusodo Hospital, Mojokerto, East Java, Indonesia

³Radiology Department, Wahidin Sudirohusodo Hospital, Mojokerto, East Java, Indonesia

*Correspondence should be addressed to Amanda Yuanita Kusdjianto; amandayuanita21@gmail.com

Abstract

Introduction: Bilateral pneumothorax is a rare case that happens in 1.3 to 1.9 percent of all cases of pneumothorax. In breast carcinoma patients, it is due to lung metastasis and conservative therapy is first selected. Lung metastasis can be found in the form of pulmonary nodules called cannonball metastases in chest X-ray (CXR). **Method:** This is a case report based on findings in chest X-ray. **Result:** A 42-year-old female came to the ER with sudden shortness of breath and pleuritic pain. She was diagnosed with breast carcinoma 3 years prior the ER visit and had undergone mastectomy and chemotherapy. Physical examination showed bilaterally decreased breath sounds. CXR AP position showed bilateral pneumothorax and multiple nodules varied in size indicative of lung metastases. Chest tubes with water-sealed drainage were inserted in both sides of the lungs. CXR after the insertion showed a reduction in the volume of pneumothorax in both sides of the lungs and cannon-ball metastases in both sides of the lungs. CXR was performed serially until hospital discharge. **Discussion:** Bilateral pneumothorax that develops in patients with a history of breast carcinoma is considered very rare. It is caused by the metastatic process and treatment. CXR can be used to detect the metastasis and its complications, such as pneumothorax. **Conclusion:** Bilateral pneumothorax is rarely seen in patients with breast carcinoma. Early detection of lung metastasis and appropriate therapy of the tumor can prevent complications, such as pneumothorax.

Keywords: bilateral pneumothorax; lung metastases; breast carcinoma; chest X-Ray

Introduction:

Bilateral pneumothorax is a rare case that happens in 1.3 to 1.9 percent of all cases of spontaneous pneumothorax. It is usually a complication of underlying malignancies, such as Hodgkin's lymphoma, lymphangioliomyomatosis, mesotheliomas, and osteosarcomas with pleural and/or parenchymal invasion.¹ A pneumothorax secondary to a malignancy is observed most frequently in soft tissue sarcomas. Therefore, bilateral pneumothorax was considered very rare in breast carcinoma.²

This secondary bilateral pneumothorax in breast carcinoma was speculated due to lung

metastasis and first selected conservative therapy.² The lung metastasis that can be found in the radiology imaging had the appearance of cannon-ball metastases.³

Method:

This case report is based on findings in the chest X-ray of a patient in Wahidin Sudirohusodo Hospital.

Case Report and Discussion:

A 42-year-old woman came to the ER with sudden shortness of breath. It started with severe dry coughs. The patient was diagnosed with

breast carcinoma 3 years ago but she had never consulted to the hospital until 7 months before the ER visit. Seven months prior the ER visit, she underwent mastectomy and received chemotherapy. Her chemotherapeutic regimen consisted of Paclitaxel, Cisplatin, and Doxorubicin.

According to physical examination results, her blood pressure was 120/80 mmHg, her heart rate (HR) was 100 beats/minute, her respiratory rate (RR) was 30 times/minute, her O₂ saturation (SpO₂) was 93% at room air, and her temperature was 37°C. She was alert and well-oriented with a Glasgow Coma Scale (GCS) score of 15/15. From the chest assessment, hyper-resonant percussion note was found, and auscultation revealed bilaterally decreased breath sounds. The COVID-19 antigen swab test was negative during the time.

She underwent an evaluation with a chest X-ray with an AP position. The AP position chest X-ray revealed bilateral pneumothorax and multiple nodules that varied in size, indicating lung metastases from the breasts. Chest tubes with water-sealed drainage were inserted on both sides of the lungs to inflate the lungs.

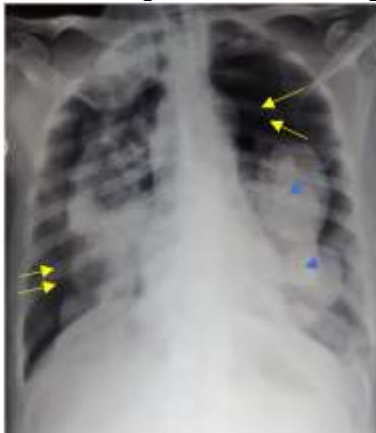


Figure 1 Anteroposterior CXR before chest tubes insertion.

Yellow arrows showed the visible visceral pleural edge on the right lung, hyperlucent left lung and the absence of the vascular lung marking on both sides of the lungs which indicates bilateral pneumothorax. Blue arrows showed multiple nodules.

After the insertion of chest tubes, chest X-ray was performed to evaluate both lungs. It revealed volume reduction due to pneumothorax in both sides of the lungs and showed a cannon-ball metastases in both sides of the lungs. Eight days after insertion, another chest X-ray assessment was performed again, and the result showed the resolution of the pneumothorax and revealed the clearer appearance of cannon-ball metastases in both lungs.

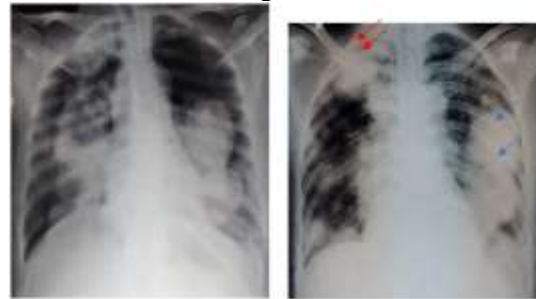


Figure 2 Anteroposterior CXR before (left) and after chest tubes insertion (day 1) (right).

It showed a reduction in the volume in pneumothorax marked by the disappearance of hyperlucent area on both lungs, the appearance of vascular markings, and the appearance of cannon-ball metastases in upper area of the right lung (red arrows) and showed clearer shapes in the middle and lower area of the left lung (blue arrows).



Figure 3 Anteroposterior CXR a day (left) and 8 days (right) after chest tube insertion.

It showed the resolution of pneumothorax and the cannon-ball metastases appeared clearer. Blue arrows showed the clearer appearance of cannon-ball metastases after the resolution of pneumothorax.

Bilateral pneumothorax that develops in patients who have a history of breast carcinoma

is considered very rare. The case itself is also very rare in all of the cases of spontaneous pneumothorax. Pneumothorax associated with lung metastasis is frequently provoked by treatment-induced necrosis of metastatic tumor.² There were a few reports of pneumothorax provoked by the treatment of lung metastases. Saito Y *et al.* reported in a journal a similar case with a bilateral pneumothorax formation following chemotherapy of tongue cancer.⁴ Bilateral pneumothorax also occurred in the case of anaplastic thyroid carcinoma reported by Lee HN *et al.* during Lenvatinib therapy.⁵ Pneumothorax also occurred as adverse event in patients with lung metastases of soft tissue sarcoma treated with pazopanib in a case reported by Verschoor AJ and Gelderbrom H.⁶ Hence, it suggests that the pneumothorax in this case could develop from the antitumor effects of the anticancer drugs which induced necrosis of metastatic tumor because in this case, pneumothorax happened when the patient was in the middle of chemotherapy sessions.

Direct tumor metastasis and invasion of the existing pulmonary cyst wall and pleura can be the other possible mechanism for the development of pneumothorax.⁴ It should be confirmed with the histopathological findings of the pulmonary and pleura cells.² In this case we did not do a histopathology procedure. Therefore, we were not sure if the pneumothorax occurred because of this pathophysiology.

It is also important to note that ruptured antecedent bulla or blebs, check-valve mechanism due to the compression of the bronchiole by metastatic lesions are also the cause of pneumothorax.² Tumor nodules act like a ball valves which obstruct the bronchiole and cause hyperinflation of the alveoli. The rupture of the emphysematous bulla in an overexpanded lung finally produce pneumothorax.⁷ Gan Z *et al.* reported a case of bilateral pneumothorax in osteosarcoma patient who developed emphysematous bulla after the formation of lung nodules because the metastatic nodules produced a bronchial obstruction.⁸ This theory most likely

happened in our patient because multiple nodules formed in most of the lung area which might be the reason of the pneumothorax caused by the formation of emphysematous bullae.

Cancer cells can also hematogenously disseminate through doorways in the vasculature known as Tumor MicroEnvironment of Metastasis (TMEM), which result in further dissemination to peripheral sites, such as to the lungs. It is reported as a common cause of lung metastases in breast cancer.⁹ In this case, multiple mechanisms could be responsible for the development of pneumothorax. It is difficult to determine the main cause of the air leak because many factors were related to each other and aggravated the patient's condition.

Chest X-rays can be used to detect abnormalities in patients admitted to the emergency condition with a history of malignancies. The findings of chest X-ray usually show multiple nodules, cavities, pleural effusion, up to pneumothorax, and rarely bilateral pneumothorax.² The appearance of the nodules can vary, up to cannonball appearances. Cannonball metastases refer to well-defined spherical nodules scattered over both lungs, being a classical presentation of hematogenous tumor spreading.³ When the pneumothorax appears, chest X-ray is also used to evaluate the success of chest tube drainage insertion to inflate the lung.²

Breast cancer is the most common primary tumor with lung metastasis. Cannonball nodules are common findings in the lung metastases of other primary tumors.¹⁰ Confirmation of the metastatic cells should be evaluated by histopathology test. CT scan should also be performed because it is considered the gold standard for the diagnosis of pneumothorax and has a much higher sensitivity in comparison to chest X-ray (CXR).²

Conclusion:

Bilateral pneumothorax is rarely seen in patients with breast carcinoma. Nevertheless, it can happen in patients with a history of tumor as

the complication of lung metastasis and therapy. Early detection of lung metastasis and appropriate therapy of tumors can prevent complications, such as pneumothorax.

If the patients with lung metastasis suddenly have difficulty in breathing and complain of pleuritic chest pain, chest X-ray and CT scan can be performed to rule out this emergency situation. Emergency treatment such as the insertion of chest tube should be done first before determining the cause of the pneumothorax to save the life of the patient. Evaluation of the resolution of pneumothorax should also be done. It can be evaluated using chest X-ray and confirmed using CT-Scan.

Acknowledgment :

The authors would like to express gratitude to the patient who allows this case to be published and the institute, Wahididin Sudirohusodo Hospital, and all the staffs that managed this case .

References :

1. Tariq, U., et. al. 2018. Simultaneous Bilateral Spontaneous Pneumothorax: A Rare Complication of Osteosarcom. *Cureus*10(6). p. e2745.
2. Kurihara, T., et. al. 2001. Bilateral pneumothorax associated with lung and pleural metastases of breast cancer. *Diagn Ther Endosc*7(2). p. 69-73.
3. Yang, H.R., Chien, H.T., and Chu, Y.K. 2016. Cannonball lung metastases as a presenting feature of ectopic hCG expression. *Journal of Oncological Sciences* 2(2). p. 58-62.
4. Saito, Y., et. al. 2020. A Case of Bilateral Secondary Pneumothorax Shortly after the Completion of Concurrent Chemoradiotherapy for Tongue Cancer. *International Journal of Otolaryngology and Head & Neck Surgery* 9. p. 93-100.
5. Lee, H. N., et. al. 2020. Bilateral Pneumothorax in a patient with anaplastic thyroid carcinoma and lung metastasis during lenvatinib therapy: a case report. *Gland Surg*9(5). p. 1579-1583.
6. Verschoor, A. J. and Gelderbrom H. 2014. Pneumothorax as adverse event in patients with lung metastases of soft tissue sarcoma treated with pazopanib: a single reference centre case series. *Clinical Sarcoma Research*4. p. 14.
7. Lee, C. H. 2003. Bilateral Spontaneous Pneumothorax During Cytotoxic Chemotherapy For Angiosarcoma of Scalp : A case report. *J Korean Med Sci* 18.p. 277-280.
8. Gan, Z. 2015. Bilateral spontaneous pneumothorax in an osteosarcoma patient with pulmonary metastases: A case report. *Oncology Letters* 11. P. 1179-1180.
9. Coste, A., et. al. 2020. Hematogenous Dissemination of Breast Cancer Cells From Lymph Nodes Is Mediated by Tumor MicroEnvironment of Metastasis Doorways. *Front Oncol*10:571100.
10. Agarwal, R., et. al. 2015. Cannon-ball pulmonary metastases as a presenting feature of stomach cancer. *Lung India* 32(3). p. 300-302.