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Persistent secondary spontaneous pneumothorax as a complication of tuberculosis infection: a case report



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Ni Made Lintya Andani^{1*}, Putu Diah Savitri²

¹Medical Doctor at Faculty of Medicine and Health Sciences, Universitas Warmadewa, Bali, Indonesia

²Radiology Department, Bali Mandara General Hospital, Bali, Indonesia

*Corresponding to:

Ni Made Lintya Andani; Medical Doctor at Faculty of Medicine and Health Sciences, Universitas Warmadewa, Bali, Indonesia;
lintyaandani@gmail.com

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ABSTRACT

Introduction: A pneumothorax is a collection of air outside the lung contained within the pleural cavity. Primary spontaneous pneumothorax (PSP) and secondary spontaneous pneumothorax (SSP) are two types of spontaneous pneumothorax that differ due to the underlying illness. If the patient has a history of pulmonary disease, including tuberculosis infection, SSP may be present. Chest X-rays, chest ultrasonography, and CT scans are imaging tests that can be used to diagnose pneumothorax. We report a case of a 20-year-old man with persistent secondary spontaneous pneumothorax as a complication of tuberculosis infection.

Case description: A 20-year-old man complained of

shortness of breath two weeks before being admitted to the hospital. He had a story of a TB infection. A chest X-ray and a CT scan were used to assess the patient. The pneumothorax is seen with the sign of reactive old tuberculosis. The surgeon inserted a chest tube drainage to empty the pneumothorax. However, following the assessment, the pneumothorax grew even larger than before.

Conclusion: Clinical evaluation should probably be the key determinant of the care strategy and assist with the initial diagnosis. Imaging modalities can help confirm a pneumothorax diagnosis and provide information about the extent of the pneumothorax.

Keywords: chest X-ray, pneumothorax, tuberculosis.

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INTRODUCTION

A pneumothorax is a collection of air outside the lung contained within the pleural cavity. This can cause problems with ventilation, oxygenation, or both. Itard and Laennec were the first to coin "pneumothorax" in 1803 and 1819. The majority of pneumothorax cases at the time were secondary to tuberculosis.^{1,2}

Pneumothorax can thus be both spontaneous and non-spontaneous. Without any prior trauma or evident triggering events, spontaneous pneumothorax occurs. There are two types of spontaneous pneumothorax: primary spontaneous pneumothorax (PSP) and secondary spontaneous pneumothorax (SSP).³ In the absence of any precipitating incident, the primary spontaneous pneumothorax (PSP) identified by

Kjaergard in 1932 is recognized as occurring in apparently healthy people without underlying lung illness. While the latter is frequently caused by a respiratory condition such as COPD, cystic fibrosis, or pneumocystis carinii pneumonia, the former is a secondary spontaneous pneumothorax (SSP).^{2,3}

Pneumothorax is a consequence of pulmonary and pleural tuberculosis (TB) that affects about 1.5 percent of patients. However, miliary TB is a rare consequence. In contrast to PSP, tuberculosis is no longer the most frequent underlying lung illness in the developed world. In individuals with pre-existing lung disease, the effects of a pneumothorax are much worse, and care is potentially more complex.^{2,4,5}

Primary spontaneous pneumothorax (PSP) affects 7 per 100,000 men and 1 per 100,000 women in the United States each

year. Recurrence occurs in most cases within the first year, with rates ranging from 25% to 50%. The first 30 days have the highest recurrence rate. In the United Kingdom, the annual incidence is 37 per 100,000 people.^{1,3} PSP is most commonly found in adolescent males. Eighty-four percent of patients in seven recent international case series were male, with a mean age of 16.3 years.⁶ Even after surgical therapy, spontaneous pneumothorax remains a substantial health hazard because the recurrence rate is believed to be between 10% and 20%. A healthy male's lifetime chance of developing a pneumothorax increases from 0.1 to 12 percent when he smokes.^{2,3}

Air can leak from the lung into the pleural space in three ways: (1) spontaneously due to alveolar rupture; (2) as a result of trauma; and (3) as a result

of gas-forming microbes. It causes air to build in the chest between the parietal and visceral pleura. The accumulation of air can put pressure on the lung, causing it to collapse.^{1,4} The major mechanism leading to pneumothorax is the spontaneous rupture of blebs or bullae. Symptoms are determined by the size of the pneumothorax and the underlying cause. Chest pain and shortness of breath are common symptoms.^{1,6}

Imaging modalities can help confirm a pneumothorax diagnosis and provide information about the extent of the pneumothorax. Still, clinical evaluation should probably be the key determinant of the care strategy and assist with the initial diagnosis. A CXR –Postero-Anterior (PA) image can confirm the diagnosis of pneumothorax in most instances, and it can also be used to estimate the extent of the pneumothorax.^{2,3} The absence of lung marks between the visceral pleural line and the chest wall, as well as radiographic displacement of the pleural line, are classic observations.⁶

For the diagnosis and treatment of pneumothorax, a variety of imaging methods have been used: Lateral x-rays, Expiratory films, Supine and lateral decubitus x-rays, Ultrasound scanning, Digital imaging, CT scanning are some of the procedures that are used.^{2,3} Standard erect chest x-rays in inspiration, rather than expiratory films, are indicated for the first diagnosis of pneumothorax, according to the British Thoracic Society Pleural Diseases Guideline. (A); Because the presence of a tiny pneumothorax may not be readily obvious, the broad adoption of digital imaging (PACS) necessitates diagnostic caution and additional tests. (D); CT scanning is suggested in cases that are uncertain or complex. (D)^{2,3}

According to the British Thoracic Society recommendations, a 2 cm radiographic pneumothorax extending over the lung field on a CXR-PA takes up about half of the hemithorax.² Pneumothorax is described as little when the visible rim between the lung edge and the chest wall is less than 2 cm, and large when the rim is greater than 2 cm. A pneumothorax is classified as little if the distance between the apex and the cupola is less than 3 cm and as large if the gap is

larger than 3 cm, according to the ACCP. When compared to CT as a reference, ultrasonography has been proven to have high sensitivity (95%), specificity (100%), and diagnostic efficacy (98%) for pneumothorax.²

The use of chest ultrasonography in diagnosing pneumothorax has proven to be highly successful. On chest ultrasonography, pneumothorax is clinically detected by reduced airflow in the auscultation and hypo-lucent regions in the lung field.⁷ In clinical emergency treatment, chest ultrasonography has recently been quite helpful in diagnosing pneumothorax. This method is an alternative to chest X-ray examination detecting pneumothorax because of its excellent sensitivity and specificity. In recent research, chest ultrasonography has also been shown to be a helpful diagnostic technique in newborns with respiratory distress.⁷

The gold standard for confirmation is a CT thorax scan. It's effective for spotting minor collections that aren't visible on plain films, and the extent of the air collection may be assessed by following the sliding lung sign' across the chest wall. It can also be used to detect surgical emphysema and bullous lung disease and abnormal chest drain placement, and other lung pathologies. Emphysema bullae can be enormous, and when found near the perimeter of the lung, they might look like a loculated pneumothorax.^{2,3} It's not uncommon to see a chest drain put into a bulla in the false idea that it's a pneumothorax. The absence of a lung edge, the round form of the bulla, and several bullae elsewhere in the lung are all indicators that the patient has a bulla. CT can help distinguish between the two in challenging circumstances.⁸ The double-wall indication is useful for distinguishing between a pneumothorax and a nearby large bulla. The air outlines both sides of the bulla wall parallel to the chest wall, causing this indication. An air-filled stomach or bowel in the chest due to a diaphragmatic hernia is another typical differential diagnosis not to be overlooked. In patients who have a persistent air leak, ventilation scintigraphy can be performed to pinpoint the source of the leak.³

We report a case of a 20-year-old man

with persistent secondary spontaneous pneumothorax as a complication of tuberculosis infection.

CASE PRESENTATION

A 20-year-old man presented to the emergency room with shortness of breath that had been bothering him for two weeks. It started with a cough that became increasingly heavier over time. He was also experiencing epigastric discomfort, nausea, and vomiting from a week ago. The soreness in the feet made it difficult to walk. The patient noticed that his weight was dropping. Three years earlier, the patient had pulmonary tuberculosis and had completed medical therapy.

The patient was alert, and his blood pressure, heart rate, saturation, and temperature were all within normal ranges. However, the respiratory rate increased by 25 times per minute. There was no retraction at the chest or failed chest on the general examination. The vesicular sound was reduced, but no rhonchi or wheezing were added. The patient's total blood count and blood chemistry were both within normal ranges. In the mild category, sodium and potassium levels were starting to drop.

An anteroposterior chest X-ray reveals a miliary lesion with a reticular look in both lungs. In addition, the broncho vascular pattern was normal. In the right hemithorax, there was an avascular lucent

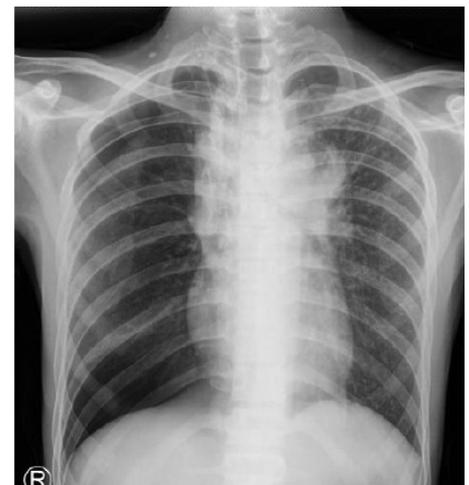


Figure 1. Chest X-ray shows right pneumothorax with miliary TB

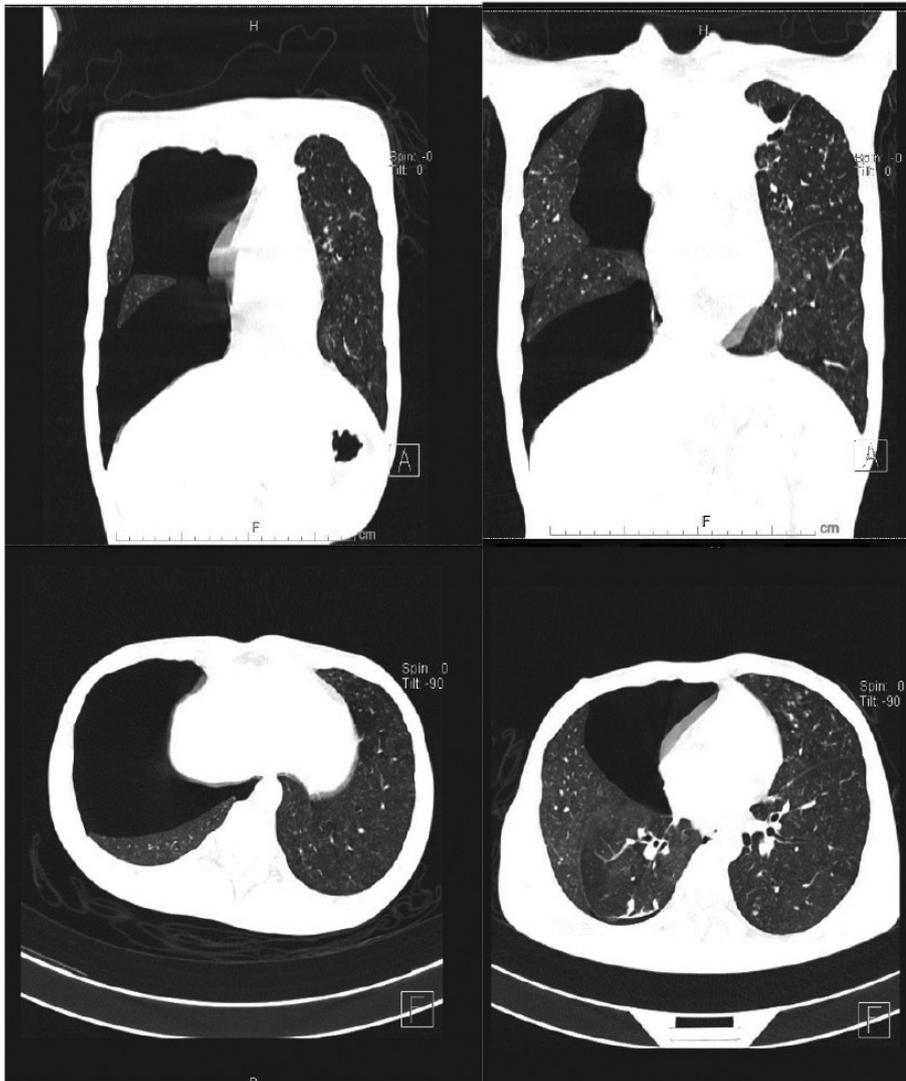


Figure 2. CT-Scan show a reactive old TB with right pneumothorax

area with the appearance of the visceral line. The heart, trachea, mediastinum, phrenicocostalis corner, diaphragm, hilum, bones, and soft tissues can all be seen normally.

A CT scan was used to assess the pneumothorax and lung. The apex of the right lung appeared to have a hollow with a thin wall on a CT scan. This cavity was 1.5 cm in diameter. The superior lobe of the left lung develops a dominating “tree in the bud” and a miliary lesion that spreads to both lungs. Both lungs have dominant paraseptal thickening and vascular thickening in the superior lobe. There was a right pneumothorax, with the upper lobe of the right lung partially collapsed. There were numerous little calcifications in that collapsed lung. Normal visualization of the trachea, heart, vasculature, and major bronchus. There was a subcentimeter-sized swelling of the paratracheal and subcarinal glands. There was no fluid present, and the bones and soft tissue were visible. All chest CT scan findings indicate reactive old tuberculosis and a right pneumothorax.

The patient had reactive old tuberculosis, a right pneumothorax, and was underweight. A pulmonologist prescribed the antibiotic levofloxacin to the patient. The surgeon performed a thoracostomy and placed a chest tube drainage at the right hemithorax in the hopes of expanding the lung and restoring its normal size. After the procedure, a chest



Figure 3. Chest X-Ray after the chest tube drainage



Figure 4. Chest X-ray after clamped of chest tube drainage in 24 hours



Figure 5. Chest X-ray after second clamped of chest tube drainage in 24 hours

X-ray was taken, and the lung expanded normally. There was continued fibrosis in the left superior hiller, with a hole at the right apex and fibro-infiltrate.

The chest tube was clamped four days after the procedure and assessed 24 hours. The lung was examined using a chest X-ray. Unfortunately, the pneumothorax reappeared in the absence of drainage.

The surgeon decided to open the drainage system and examine the lung. The vital signs were steady after five days, and the patient did not complain of pain or shortness of breath. The drainage was once again clamped. After 24 hours of clamped drainage, a chest X-ray was taken to examine the lung once more. The right pneumothorax was still pneumothorax, and the lung was collapsing more than previously. After a lengthy conversation with the pulmonologist and the patient's family, the surgeon opted to refer the patient to another hospital with a cardiothoracic surgeon.

DISCUSSION

A pneumothorax is a collection of air outside the lung contained within the pleural cavity. There are two types of pneumothorax: spontaneous and non-spontaneous. Without any prior trauma or evident triggering events, spontaneous pneumothorax occurs. There are two types of spontaneous pneumothorax: primary spontaneous pneumothorax (PSP) and secondary spontaneous pneumothorax (SSP) (SSP). The major symptoms are pleuritic chest discomfort and dyspnea. Imaging procedures, such as chest X-Ray, chest ultrasonography, or CT-Scan, are frequently used to confirm the diagnosis of pneumothorax.¹⁻³

A chest X-ray with a posteroanterior (PA) perspective allows the size of the pneumothorax to be estimated.^{2,3} The absence of lung marks between the visceral pleural line and the chest wall, as well as radiographic displacement of the pleural line, are classic observations. On chest ultrasonography, lower airflow on auscultation and hypo-lucent regions in the lung field are clinical signs of pneumothorax.^{6,7}

The gold standard is a CT thorax scan. It's effective for spotting minor collections that aren't visible on plain films, and the

extent of the air collection may be assessed by following the sliding lung sign' across the chest wall. It can also be used to detect surgical emphysema and bullous lung disease and abnormal chest drain placement, and other lung pathologies. Emphysema bullae can be enormous, and when found near the perimeter of the lung, they might look like a loculated pneumothorax.^{2,3}

In a meta-analysis study, Dahmarde et al. discovered that chest ultrasonography had a relatively high accuracy in identifying pneumothorax in newborns and adults.⁷ The ultrasound sensitivity for pneumothorax diagnosis in newborns was 96.7 percent, whereas the ultrasound sensitivity in adults was 82.9 percent. The "absent lung sliding" sign had an 87.2 percent sensitivity for the diagnosis of pneumothorax, whereas the "lung point" sign had an 82.1 percent sensitivity.⁷

The results of Wu Ding et al. study showed that ultrasonography had greater sensitivity and equivalent specificity when compared to CR for the diagnosis of pneumothorax.⁹ Although there was no statistical significance, it appeared that when both the lung sliding sign and the comet tail sign were absent on ultrasonography, the diagnosis of pneumothorax was more reliable⁹

Omar et al. demonstrated examples in which an AP chest X-ray failed to reveal an existing pneumothorax.¹⁰ Patients who had been in a car accident and had tachypnea but no signs of pneumothorax on CRX. This highlights the value of a chest CT in any trauma sufferer who is tachypneic or hypoxic despite a normal AP chest radiograph. This is especially critical in individuals on positive pressure breathing for an extended period.¹⁰

The gold standard for diagnosing pneumothorax is a CT thorax scan. CXR is the favored initial approach, although it is more sensitive for minor pneumothorax. CXR should be used to detect any substantial pneumothorax to cause symptoms. Furthermore, chest CT is unnecessary for most uncomplicated spontaneous pneumothorax cases previously recognized on CXR due to cost and concerns about relative radiation exposure. According to several studies, POCUS (point-of-care ultrasonography)

provides higher sensitivity and specificity for pneumothorax than CXR. For the diagnosis of pneumothorax, chest ultrasonography will show the lack of lung sliding sign, lung point, and comet tail sign.¹⁰

In patients suspected of having a pneumothorax, the first imaging study we can perform is a chest X-ray with a posteroanterior view. Patients with trauma or a history of lung disorders including tuberculosis, COPD, cystic fibrosis, or pneumocystis carinii pneumonia should be given additional attention.¹⁰ When it comes to diagnosing pneumothorax, chest ultrasonography can be more accurate. POCUS can detect pneumothorax in babies experiencing respiratory distress and having insufficient ventilation. Nonetheless, the chest CT scan is the gold standard for diagnosing pneumothorax, even at small diameters that aren't visible on a CXR. Choosing the best imaging can assist physicians in making the optimal therapy selection.

CONCLUSION

Clinical evaluation should probably be the key determinant of the care strategy and assist with the initial diagnosis. Imaging modalities can help confirm a pneumothorax diagnosis and provide information about the extent of the pneumothorax.

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ETHICAL CLEARANCE

Patient approval has been obtained in this study and fulfilled ethics approval from the International Committee of Medical Journal Editors (ICMJE).

CONFLICT OF INTEREST

The author declares that there were no conflicts of interest in this study.

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AUTHOR CONTRIBUTION

The author has fully contributed to the study.

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