

# Recurrent secondary spontaneous pneumothorax in silicosis: a case report

## *Pneumotorax spontan secundar recurent în silicoză: caz clinic*

### Abstract

Silicosis is an occupational lung disease which is caused by inhalation and accumulation of crystalline silica particles in the lung. It commonly occurs in workers involved in quarrying, mining, sandblasting, tunneling, foundry work, and ceramics. Pneumothorax is one of the complications of silicosis with pleural involvement. The occurrence of pneumothorax in a patient with silicosis is a rare event, but it may be fatal. The rate of pneumothorax recurrence in silicosis is usually low. We report a case of recurrent secondary spontaneous pneumothorax in silicosis.

**Keywords:** occupational disease, pleura, pneumothorax, silicosis

### Rezumat

Silicoza este o boală pulmonară profesională, care este cauzată de inhalarea și acumularea particulelor de siliciu cristalin în plămân. Ea apare frecvent la lucrătorii din cariere de piatră, minerit, sablare, la constructorii de tunele, la cei din turnătorie sau industria ceramică. Pneumotoraxul este una dintre complicațiile silicozei, cu afectare pleurală. Apariția pneumotoraxului la un pacient cu silicoză este un eveniment rar, dar poate fi fatală. Rata recurenței pneumotoraxului este, de obicei, scăzută la pacientul cu silicoză. Vom prezenta un caz de pneumotorax spontan secundar recurent în silicoză.

**Cuvinte-cheie:** boală ocupațională, pleură, pneumotorax, silicoză

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Abbreviation: SSP, secondary spontaneous pneumothorax; AFB, acid-fast bacilli; CT, computed tomography; HRCT, high resolution computed tomography; COPD, chronic obstructive pulmonary disease.

## Introduction

Silicosis is an occupational lung disease caused by the inhalation and accumulation of crystalline silica particles in the lung. Silicosis is the most prevalent type of pneumoconiosis<sup>(1,2)</sup>. Some complications may be related to silicosis, but pleural involvement is rare. Pneumothorax is one of the silicosis complications associated with the pleura. In silicosis, the pneumothorax is usually unilateral and may be fatal<sup>(3-5)</sup>. We report a case of recurrent secondary spontaneous pneumothorax (SSP) in a silicosis patient.

## Case report

A 39-year-old male was admitted to our hospital with the complaint of shortness of breath and left side chest pain started one week before admission. He also complained of productive cough. There was no history of trauma. One year ago, he had a first SSP on the right side and had been managed with open thoracotomy and decortication procedure. He had also been treated with anti-tuberculous drugs for six months. The acid-fast bacilli (AFB) of sputum and bronchial washing smears were negative. The *Mycobacterium tuberculosis* of sputum and bronchial washing culture was also negative at that time. After the re-evaluation of chest X-ray and computed tomography (CT) of the thorax, he was diagnosed

with silicosis (Figure 1). He was an ex-smoker (12 cigarettes per day) for 26 years and he stopped smoking one year before. Occupational history revealed that he worked as a builder for 18 years, with exposure to stone dust for eight hours per day. He did not wear any respiratory protection during his working time.

On the physical examination, the patient was in moderately good general condition, with a blood pressure of 120/80 mmHg, heart rate of 85/min, respiratory rate of 24/min, and peripheral oxygen saturation of 94% in room air. On pulmonary examination, the percussion of left side chest wall was hyper-resonant and pulmonary auscultation revealed the reduction of the breath sounds in the left hemithorax. Blood CBC was normal. Arterial blood gas analysis showed respiratory alkalosis. Arterial blood pH was 7.456, the partial pressure of oxygen (PaO<sub>2</sub>) was 77.6 mmHg, partial pressure of arterial carbon dioxide (PaCO<sub>2</sub>) was 31.6 mmHg, bicarbonate was 21.8 mmol/L, and oxygen saturation was 96.2%. Chest radiograph showed left pneumothorax with bilateral perihilar eggshell calcification (Figure 2). Three samples of sputum for AFB smear and Xpert® Mtb/Rif result were negative. A sample of sputum culture for pyogenic organism was negative.

This patient was managed with pleural drainage tube, supplemental oxygen, analgesic, and medical rehabilitation

exercise. Clinical symptoms and chest X-ray had improved after several days of treatment. High-resolution computed tomography (HRCT) was performed after pneumothorax resolution and revealed bilateral irregular calcification, multiple eggshell calcifications, fibrosis in the right subpleural side, and honeycomb appearance at the right side (Figure 3). When compared with the previous CT of the thorax, the HRCT showed the progressivity of silicosis. The patient was discharged from the hospital in good condition.

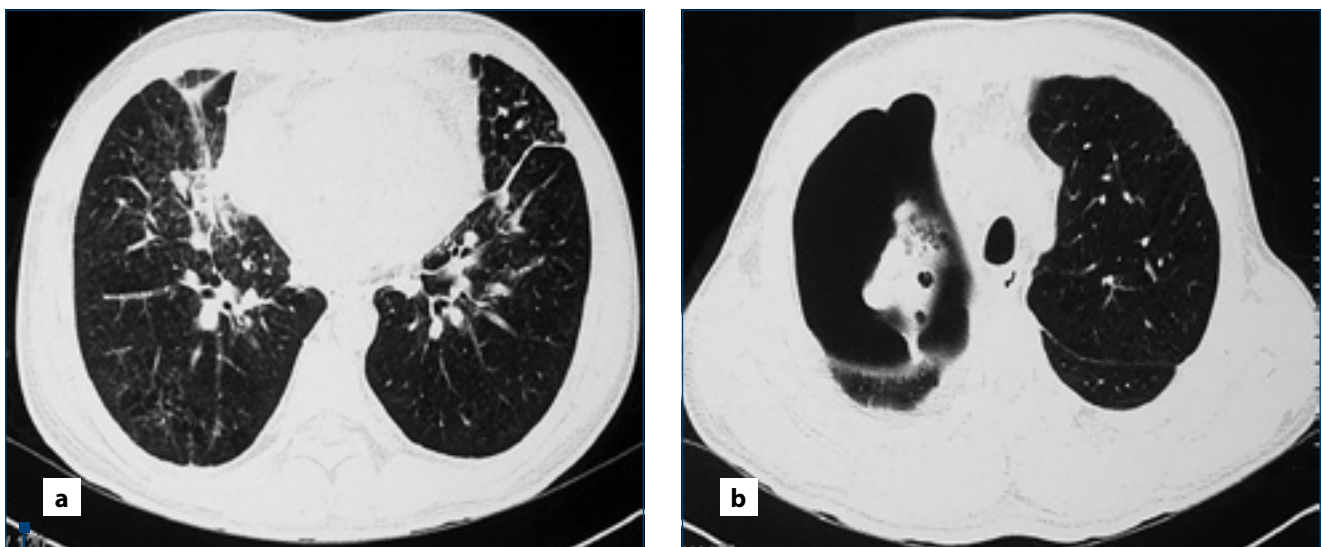
## Discussion

Silicosis commonly occurs in workers involved in quarrying, mining, sandblasting, tunneling, foundry work, and ceramics industry<sup>(2,6)</sup>. Respirable crystalline silica is <10 µm in diameter and it can reach to the basal of the lung. It accumulates and induces silicosis although the exposure is low<sup>(7)</sup>. There are three types of clinical and pathological forms of silicosis, based on the intensity and duration of exposure: acute, accelerated and chronic form. The acute form is caused by substantial exposure to silica and usually manifests within 2 years after the initial exposure. The accelerated form develops between 2 to 10 years of exposure. In the chronic form, symptoms will appear after more than 10 years<sup>(2,4,6)</sup>. Chronic silicosis is the most common presentation of silicosis and the progression of disease can be rapid<sup>(1,2)</sup>. In a study of cement factory workers in Indonesia who had silicosis, the prevalence of silicosis for a duration of fewer than 5 years was 44%, and 82.2% for more than 10 years<sup>(8)</sup>. In our patient, his first clinical manifestation occurred after 17 years of exposure.

The diagnosis of silicosis can be made based on the history of silica exposure, and the clinical and radiological profile which is consistent with the disease. The chest X-ray shows multiple diffusely distributed nodules <10 mm in diameter which are predominantly in the superior

and posterior regions of the lungs. The nodules can coalesce and form opacities >10 mm in diameter, which are indicative of progressive massive fibrosis. Hilar and mediastinal lymph node enlargement with calcification or eggshell pattern is highly suggestive of the diagnosis. It is commonly found in the accelerated and chronic form. The chest X-ray in the acute form reveals perihilar and ground-glass alveolar opacities. It is also known as silicoproteinosis because the chest X-ray resembles alveolar proteinosis. High resolution computed tomography should be used if the clinical and radiological profile is unclear. The principal findings are diffuse nodules, branched centrilobular opacities, subpleural nodules, and eggshell pattern<sup>(2)</sup>. Lung biopsy is only performed to exclude other conditions in silicosis<sup>(9)</sup>.

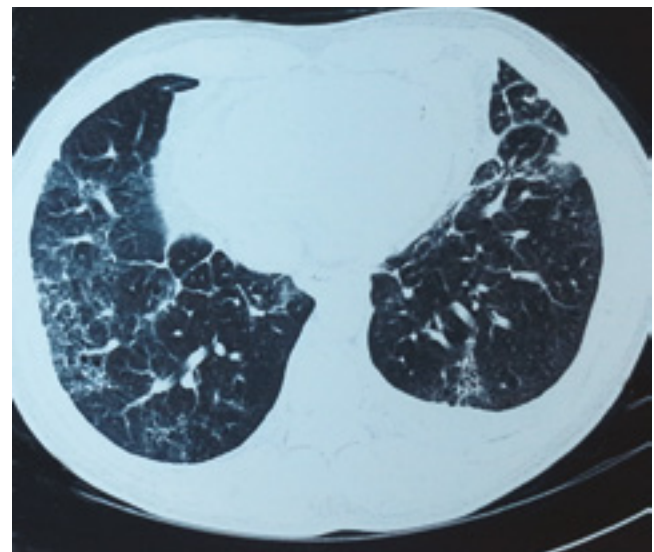
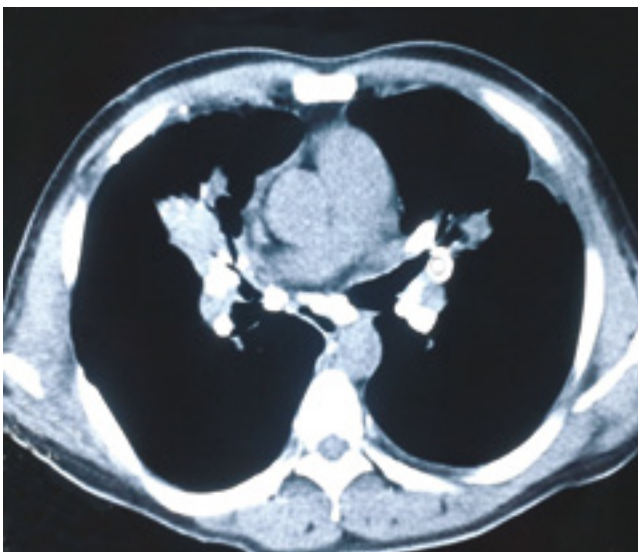
Silicosis is associated with pulmonary and systemic comorbidities. Some comorbidities that have been documented in silicosis are tuberculosis, chronic obstructive pulmonary disease (COPD), lung cancer, glomerulonephritis, rheumatoid arthritis, and other autoimmune diseases<sup>(2)</sup>. Pneumothorax is a rare complication of silicosis. Most cases are unilateral, which are related to chronic silicosis with progressive massive fibrosis. There are only a few cases of bilateral pneumothorax that have been reported and they are related to accelerated silicosis<sup>(5)</sup>. The rate of recurrence for SSP is ranging from 39% to 47%<sup>(10)</sup>. In our case, SSP was unilateral and it had recurred within one year. Mohebbi *et al.* found that SSP in silicosis patients is related to the rupture of bullae<sup>(11)</sup>. Due to the toxic injury of silica, the formation of the bleb is led by the products of inflammatory response which affect the elastic fibers of the alveolar wall. Some congenital alveolar defect and dysfunction of type II cells may play a role in the development of pneumothorax<sup>(4)</sup>. Although the occurrence of SSP is rare in silicosis, the physician should be aware of this complication in the patient with a history of silicosis. ■



**Figure 1.** Thoracic CT scan showed: (a) bilateral perihilar calcification and (b) right sided pneumothorax.



**Figure 2.** Chest X-ray: Left pneumothorax with bilateral perihilar eggshell calcification



**Figure 3.** HRCT of thorax after the resolution of pneumothorax showed bilateral irregular calcification, multiple egg shell calcification, fibrosis in right subpleural side, and honeycomb appearance at the right side

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