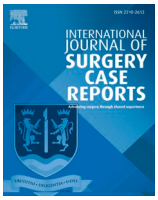
International Journal of Surgery Case Reports 97 (2022) 107407

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.elsevier.com/locate/ijscr



Case report

Diagnostic approach and management of bilateral pneumothorax due to silicosis in Indonesian male: A rare case

Risa Natalia Siburian, Kristin Purnama Dewi, Winariani Koesoemoprodjo *

Department of Respiratory and Pulmonary Medicine, Faculty of Medicine, Universitas Airlangga – Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

ARTICLE INFO

Keywords:
Bilateral pneumothorax
Silica
Silicosis
VATS

ABSTRACT

Background: Bilateral pneumothorax due to silicosis was a rare case, so diagnosis and management are essential to the report.
Case presentation: A 29-year-old Indonesian male complained of shortness of breath, cough, and body weight loss. Medical history interpreted pulmonary tuberculosis and successful treatment in 6 months. Physical examination and chest radiograph showed bilateral pneumothorax. The patient was diagnosed with bilateral pneumothorax due to silicosis and treated usage chest tube insertion and video-assisted thoracoscopic surgery (VATS). The patient has improved his condition after a few days of receiving post-surgery treatment.
Discussion: Exposure to silica can determine through a spectrophotometer. The therapy of silicosis is still challenging because of the disease's progressivity and complications.
Conclusion: Silicosis is not only a chronic and progressive disease but also leads to many complications, including bilateral pneumothorax.

1. Introduction

Silicosis is a form of pneumoconiosis caused by crystalline silica particles and causes remarkable morbidity and mortality worldwide [1,2]. Crystalline silica is one of the most frequent particles causing occupational lung disease. Silica exists in crystalline and amorphic forms [3]. Workers with silicosis reported 18.3–199 % (South Africa) and 37 % (Brazil) [4,5]. Silicosis causes irreversible fibrosis and lung damage. In addition, silica is a carcinogenic agent, and exposure to silica might cause lung cancer in workers with silicosis [6]. One of the complications of patient silicosis is a pneumothorax reported as much as 44 % of silicosis patients to experience a pneumothorax [7]. We are interested in registering an Indonesian adult with secondary spontaneous bilateral pneumothorax due to silicosis. We write based on SCARE 2020 guidelines [8].

2. Case presentation

A 29-year-old Indonesian male attended the emergency room with a chief complaint of intermittent shortness of breath for 3 months before admission, which got worse in the last 1 week. The patient also complained of coughing up phlegm (white sputum) accompanied by chest pain since a week ago. The patient has lost weight (±10 kg) since experiencing shortness of breath. Medical history showed pulmonary tuberculosis and successful treatment for 6 months which sputum culture and GeneXpert showed *Mycobacterium tuberculosis* negative. The patient has worked for 8 years in the ceramic stone craftsman industry.

Physical examination showed weakness, respiratory rate of 28×/min, pulse rate of 104×/min, SO_2 of 97 % with cannula nasal 4 L/min, a body weight of 48 kg, body height of 164 cm, BMI of 17.84 kg/m^3. Chest investigation showed hypersonic and low vesicular asymmetries in 2/3 left and 1/3 right hemithorax. Abnormal laboratory data included leukocytosis (17.290/UL) and agranulocytosis (79 %), while blood gas analysis showed pH of 7.37, pCO_2 of 36 mm Hg, pO_2 of 113 mm Hg, HCO_3 of 20.8 mmol/L, TCO2 of 21.9 mmol/L, BE of −4.5 mmol/L, SO_2 of 98 %, and $AaDO_2$ of 55.9 mm Hg. Chest X-ray showed a collapsed line and avascular area on the left and right lungs (Fig. 1). The chest tube was placed on the right and left lungs [9,10], though complete lung inflation has not been observed yet on the right and left sides. Spectrophotometry examination for silica from pleural fluid showed silica content of 49.45 ppm SiO_2 (right lung) and 85.78 ppm SiO_2 (left lung).

On the 5th day, sound right and left lung inflation had not been an

* Corresponding author: Winariani Koesoemoprodjo, Department of Respiratory and Pulmonary Medicine, Faculty of Medicine, Universitas Airlangga – Dr. Soetomo General Academic Hospital, Jl. Mayjend Prof. Dr. Moestopo No. 6-8, Airlangga, Gubeng, Surabaya, East Java, 60286, Indonesia.
E-mail address: winariani.koesoemoprodjo22@gmail.com (W. Koesoemoprodjo).

https://doi.org/10.1016/j.ijscr.2022.107407
Received 13 June 2022; Received in revised form 7 July 2022; Accepted 8 July 2022
Available online 11 July 2022

improvement. Thus HRCT (high-resolution computed tomography) scan showed bilateral pneumothorax, bilateral lung collapse, bronchopleural fistula on the left lung, bleb on the right lung and suspicion of the specific inflammatory process (Fig. 2). Hence, it was decided to conduct video-assisted thoracoscopic surgery (VATS) and fistula repair on the right lung. In this procedure, wedge resection (partial resection of pulmonary tissue) of the superior lobe of the right lung was conducted, revealing thick lung parenchyma, a rough surface with copious small nodules spread evenly on all pulmonary lobes and the presence of bronchopleural fistula on the superior lobe of the right lung (Fig. 3). Spectrophotometry results for silica from fluid in the right thoracic cavity revealed 11.30 ppm SiO_2, and tissue silica content was 38,473.43 ppm SiO_2.

The right lung appeared more inflated on follow-up chest X-ray evaluation than before (Fig. 4). The patient had also undergone respiratory exercises. Three weeks after the first surgical procedure, the patient was scheduled for follow-up surgery on the left lung, i.e., bronchopleural fistula repair. However, surgery revealed thickening and adhesion of the pleura without evidence of bronchopleural fistula. Thoracotomy and decortication with 28Fr thoracic drain insertion were conducted to release pleural adhesion on the superior and inferior lobe, causing the left lung to inflate well. Spectrophotometry results for silica from fluid in the left thoracic cavity revealed 48.95 ppm SiO_2, and tissue silica content was 1331.83 ppm SiO_2. After 3 days of postoperative admission, shortness of breath resided, and the patient was discharged.

3. Discussion

Diagnosis of silicosis is based on spectrophotometry to detect mineral dust or its metabolites [11,12]. In comparison, X-ray and CT-Scan could reveal pleural thickening and conglomerative lesions. Acute silicosis might show the alveolar filling pattern and rapidly declining condition [2]. The declining clinical condition of patients with silicosis was mainly due to complications including massive progressive fibrosis, infection, cor pulmonale, pneumothorax or tracheobronchial compression by lymph nodes. Spontaneous pneumothorax was associated with chronic silicosis with massive advanced fibrosis.

In most cases, pneumothorax occurs unilaterally. Bilateral pneumothorax was very rarely seen and mainly observed on accelerated silicosis. In the Rajasthan study, bilateral pneumothorax in silicosis cases only appeared in four patients, while unilateral pneumothorax was observed in 16 patients [13]. Silica causes inflammatory response affected elastic fibers of alveolar walls, causing bleb formation [14]. Massive pulmonary fibrosis causes rigidity in the lung. Spontaneous

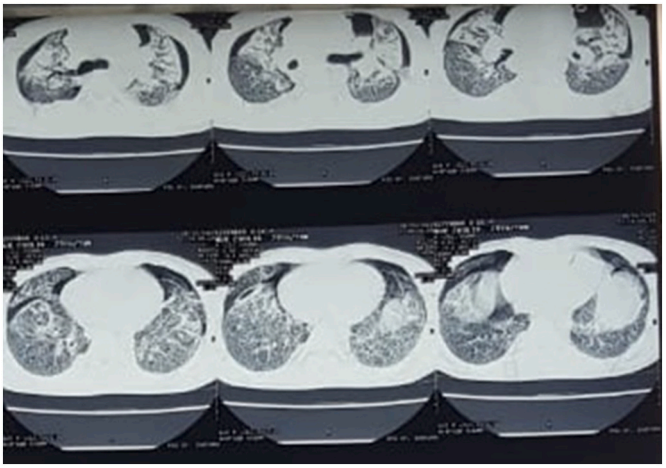


Fig. 2. Thorax CT-Scan showed fibrosis and nodule in the lungs.

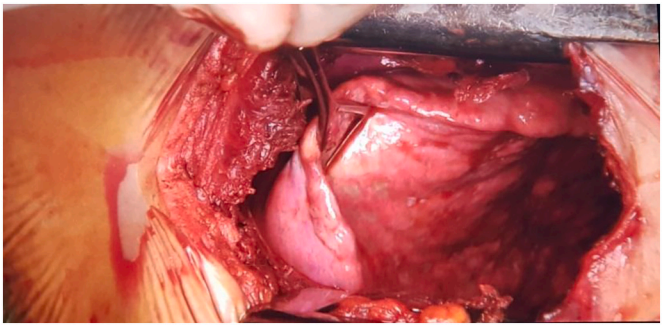


Fig. 3. Lung condition during VATS procedure.

secondary pneumothorax occurred due to ruptured bulla and increased elasticity of lung parenchyma. Congenital alveolar abnormality and type 2 cell dysfunction increase the risk of pneumothorax [3].

The fibrosis process of chronic silicosis was irreversible and untreatable. The feasible management of this disease was to prevent illness progressivity and prevent the development of disease complications. The disease will worsen even without further exposure. In acute silicosis, deterioration in the condition occurs rapidly, and ventilation support should be provided for respiratory failure. Chest tube insertion

Fig. 1. Chest X-ray showed collapse line and avascular area in lungs (left lungs of >50 % and right lung of <50 %).

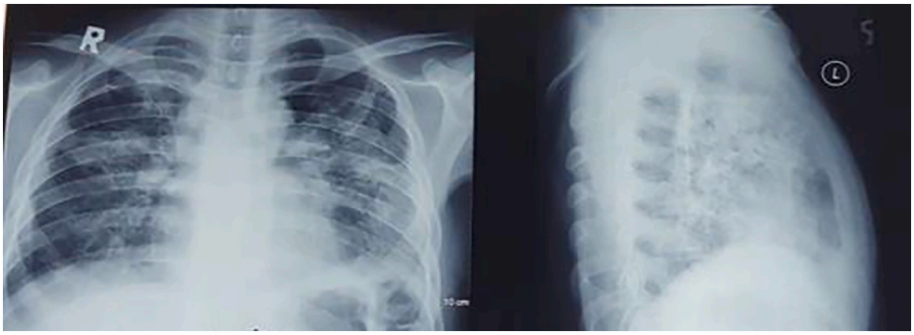


Fig. 4. Chest X-ray post VATS procedure.

should be conducted in the presence of pneumothorax. Bronchopleural fistula formed in silicosis cases required surgical intervention [2]. Intervention to prevent inflammation in chronic silicosis was by aluminium inhalation or polyvinyl pyridine-*N*-oxide and oral tetrandrine. Several studies mentioned lung lavage to remove silica from the lungs, but the satisfactory result on silicosis progressivity should be studied further. Several acute silicosis and accelerated silicosis cases appeared with poor prognosis in younger patients; thus, lung transplantation should be considered. The most critical aspect of managing silicosis is prevention; hence, high alertness regarding silicosis exposure by adequately using of personal protective equipment at work is crucial [13].

Recurrent pneumothorax could be treated with VATS to reduce the risk of recurrence. VATS is a minimally invasive surgical procedure with only 4 to 5 cm incision [15]. VATS is preferable as it is more effective and safer than open surgery. Fewer complications were also reported for the VATS procedure. Several risks persist as surgical complications, including postoperative bleeding, empyema and postoperative pain [16].

4. Conclusion

Silicosis is an occupational lung disease-causing chronic and progressive inflammation with various severe complications and mortality. Current treatment for silicosis was mainly to alleviate symptoms and prevent complications due to silicosis. However, there has not been discovered treatment to eliminate silicosis in patients.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Ethical approval

Not applicable.

Funding

None.

Guarantor

Winariani Koesoemoprodjo is the person in charge of the publication of our manuscript.

Research registration number

Not applicable.

Credit authorship contribution statement

All authors contributed toward data analysis, drafting and revising the paper, gave final approval of the version to be published and agree to be accountable for all aspects of the work.

Declaration of competing interest

Risa Natalia Siburian, Kristin Purnama Dewi, and Winariani Koesoemoprodjo declare that they have no conflict of interest.

Acknowledgement

We would like to thank our editor, “Fis Citra Ariyanto”.

References

[1] S.S. Nandi, S.V. Dhatrak, K. Sarkar, Silicosis, progressive massive fibrosis and silico-tuberculosis among workers with occupational exposure to silica dusts in sandstone mines of Rajasthan state: an urgent need for initiating national silicosis control programme in India, Fam. Med. Prim. Care Rev. 10 (2) (2021) 686–691, https://doi.org/10.4103/jfmpc.jfmpc_1972_20.

[2] Y.C.E.D. Djatioetomo, I.A. Marhana, Deadly dust: silicotuberculosis as a downplayed and overlooked fatal disease in Indonesia, Ann. Med. Surg. 78 (2022), 103794, https://doi.org/10.1016/j.amsu.2022.103794.

[3] P. Mishra, S.E. Jacob, D. Basu, M.K. Panigrahi, V. Govindaraj, Bilateral spontaneous pneumothorax in chronic silicosis: a case report, in: Case reports in pathology 2014, 2014, https://doi.org/10.1155/2014/561861.

[4] G.J. Churchyard, R. Ehrlich, J.M. teWaterNaude, L. Pemba, K. Dekker, M. Vermeijs, et al., Silicosis prevalence and exposure-response relations in south african goldminers, Occup. Environ. Med. 61 (10) (2004) 811–816, https://doi.org/10.1136/oem.2003.010967.

[5] T.P. Souza, G. Watte, A.M. Gusso, R. Souza, J.D.S. Moreira, M.M. Knorst, Silicosis prevalence and risk factors in semi-precious stone mining in Brazil, Am. J. Ind. Med. 60 (6) (2017) 529–536, https://doi.org/10.1002/ajim.22719.

[6] A. Athavale, A. Iyer, D. Sahoo, K. Salgia, A. Raut, N. Kanodra, Incidence of silicosis in flourmill workers, Indian J. Occup. Environ. Med. 15 (3) (2011) 104–108, https://doi.org/10.4103/0019-5278.93199.

[7] M.K. Meena, R. Singh, N. Joshi, S.S. Rathore, S. Chadalawada, M. Abubakar, et al., Silicosis with secondary spontaneous pneumothorax in the Western Rajasthan, Cureus. 12 (11) (2020), e11811, https://doi.org/10.7759/cureus.11811.

[8] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, International Journal of Surgery 84 (2020) 226–230, https://doi.org/10.1016/j.ijsu.2020.10.034.

[9] A.N. Charisma, A. Bakhtiar, Wedge resection on recurrent pneumothorax, failed lung expansion after needle aspiration: a case report, Int. J. Surg. Case Rep. 83 (2021), 106000, https://doi.org/10.1016/j.ijscr.2021.106000.

[10] N. Hapsari, R. Yudhawati, Bilateral primary spontaneous pneumothorax with multiple bleb performed by VATS and wedge resection: a rare case in indonesian adult and review article, Int. J. Surg. Case Rep. 85 (2021), 106222, https://doi.org/10.1016/j.ijscr.2021.106222.

[11] W. Koesoemoprodjo, V. Merinda, Seorang penderita siliko tuberkulosis dengan penyulit Pneumotoraks[Pneumothorax in a silico-tuberculosis patient: a case report], Jurnal Respirasi 2 (3) (2016) 76–81, https://doi.org/10.20473/jr.v2-I.3.2016.76-81.

[12] S. Sahrun, W. Koesoemoprodjo, A. Permatasari, Pneumotoraks bilateral dan transaminitis non spesifik pada silikosis: (Bilateral pneumothorax and transaminitis in silicosis patient: a case Report), Jurnal Respirasi 4 (3) (2018) 76–85, https://doi.org/10.20473/jr.v4-I.3.2018.76-85.
[13] M.K. Bairwa, N. Joshi, S.P. Agnihotri, Silicosis with bilateral spontaneous pneumothorax in Rajasthan, Indian J. Occup. Environ. Med. 23 (3) (2019) 112–116, https://doi.org/10.4103/ijoem.IJOEM_247_18.
[14] G.N. Srivastava, R. Prasad, M. Meena, M. Hussain, Acute silicosis with bilateral pneumothorax, BMJ Case Rep. 2014 (2014), https://doi.org/10.1136/bcr-2013-200089.
[15] J. Aragón, Méndez I. Pérez, Four years' experience in uniportal video-assisted thoracoscopic surgery for major lung resections: influence of silicosis in clinical outcomes, J. Vis. Surg. 2 (2016) 95, https://doi.org/10.21037/jovs.2016.04.13.
[16] I. Ingolfsson, E. Gyllstedt, R. Lillo-Gil, A. Pikwer, P. Jönsson, T. Gudbjartsson, Reoperations are common following VATS for spontaneous pneumothorax: study of risk factors, Interact. Cardiovasc. Thorac. Surg. 5 (5) (2006) 602–607, https://doi.org/10.1510/icvts.2006.129676.