SECONDARY SPONTANEOUS PNEUMOTHORAX IN PATIENTS WITH SILICOsis

MOMKESH BAIrwA1, AMBIKA SHArMA2*, MEENGANDHA LUNIWAL3

Received: 10 February 2023; Revised: 24 April 2023; Accepted: 12 May 2023

ABSTRACT

Background and aims: Patients with silicosis are at increased risk of pneumothorax. However, the true incidence of pneumothorax in these patients is yet unknown. Our objective was to study the proportion of secondary spontaneous pneumothorax (SSP) in patients with silicosis who present with acute respiratory deterioration. We also analyzed the risk factors, clinical course, actual management, and treatment outcomes of pneumothorax in patients with silicosis.

Materials and methods: It was a hospital-based descriptive cross-sectional study. A total of hundred silicosis patients presenting with any acute worsening respiratory symptoms (dyspnea, cough, and chest pain) warranting admission were enrolled. A detailed history, clinical examination, and radiological investigations were done in all cases.

Results: A total of 100 patients were included in this study. The mean age of subjects was 51.6 years. Breathlessness was the most common presenting symptom followed by chest pain. A total of 43 (43%) patients had pneumothorax at presentation. Right-sided pneumothorax was seen in 26 (26%) cases, left-sided in 11 (11%) cases, and six patients (6%) had bilateral pneumothorax. No significant correlation of smoking with pneumothorax was observed in the present study. Around 42% of patients had pulmonary tuberculosis which was microbiologically confirmed.

Conclusion: The present study emphasizes that all patients of silicosis who present with acute worsening shortness of breath and or chest pain need to be evaluated for pneumothorax.

Journal of the Association of Physicians of India (2023): 10.59556/japi.71.0348

INTRODUCTION

Pulmonary complications of inhalation of toxic substances at workplaces are well described in the literature. Silicosis results due to inhalation of silica dust. The crystalline form of silicon dioxide is responsible for pulmonary disease. Generation of respirable crystalline silica occurs due to cutting, grinding, blasting, and crushing of silica-containing materials.

There are several populations in India at excessive risk of developing silicosis. The employees in gold, mica, and coal mines, and those employed in the ceramic and pottery industry, agate and slate pencil industry, brick employees, and stone cutters are particularly at risk. In India, silicosis is prevalent in Gujarat, Rajasthan, Pondicherry, Haryana, Uttar Pradesh, Bihar, Chhattisgarh, Jharkhand, Orissa, and West Bengal. The prevalence of silicosis in India ranges widely from 3.5% in ordnance factories to 54.6% in the slate–pencil industry.

In the presence of worsening respiratory symptoms complications associated with the disease should be kept in mind such as tuberculosis, pneumothorax, lung cancer, respiratory failure, respiratory infection, cor pulmonale, etc. Although involvement of pleura is uncommon in silicosis, secondary spontaneous pneumothorax (SSP) is reported in the literature. SSP can be unilateral or bilateral in these patients. The exact incidence and prevalence of SSP in silicosis is yet unknown. This study aimed to find the proportion of SSP in patients with silicosis admitted with acute respiratory deterioration.

MATERIALS AND METHODS

It was a hospital-based descriptive cross-sectional study. A total of hundred silicosis patients presenting with any acute worsening respiratory symptoms (dyspnea, cough, and chest pain) warranting admission were prospectively studied. A detailed history (including occupational history), clinical examination, radiological, blood, and sputum investigations were done in all cases. Pneumothorax was confirmed on a chest X-ray. Diagnosis of silicosis was based on a combination of the history of occupational exposure to silica dust and typical radiological features in chest radiographs and or computed tomography of the chest.

RESULTS

A total of 100 patients were included in the study and the mean age of the study group was 51.6 years. The majority of (51%) patients were in the age-group 41–60 years followed by 25% of patients in the 20–40 years age-group (Table 1). Around 92% study population was male and 8% were female. Around 66% of the study cohort were smokers. The mean duration of exposure to silica particles was 14 years and 11 months. Breathlessness was the most common presenting symptom and was found in all patients followed by chest pain (Table 2). Respiratory failure at admission was seen in all patients on admission which was measured by peripheral oxygen saturation by pulse oximetry and later confirmed on arterial blood gas analysis. Most of the silicosis patients were from the mining and stone-cutting industry (Table 3).

Among admitted patients with silicosis, 43% of patients had pneumothorax at presentation (Table 4). Right-sided pneumothorax was seen in 26 cases (26%) (Fig. 1), left-sided in 11 cases (11%) (Fig. 2), and six patients (6%) had a bilateral pneumothorax (Fig. 3). Around 42% of patients had pulmonary tuberculosis which was microbiologically confirmed by the sputum acid-fast bacilli (AFB) test and or cartridge-based nucleic acid amplification test (CBNAAT). Around 39% of patients were rifampicin sensitive tuberculosis and the remaining three (3%) were resistant (Table 5).

DISCUSSION

A wide range of pulmonary diseases is associated with secondary spontaneous pneumothorax. There are few studies in which unilateral or bilateral pneumothorax has been reported in patients with silicosis. Only scanty literature is available which has studied the incidence of pneumothorax and associated risk factors for the same in silicosis patients. Present study demonstrates that SSP is a common complication in patients with silicosis and was seen in nearly...
Secondary Spontaneous Pneumothorax in Patients with Silicosis

Journal of the Association of Physicians of India, Volume 71 Issue 10 (October 2023)

To AFB stain in the diagnosis of tuberculosis in our study. There were 26 cases of smear-negative tuberculosis which showed positive CBNAAT. As per a study by Prakash et al. in smear-negative individuals, the sensitivity of CBNAAT is 80.9%.10 Three of all pulmonary tuberculosis patients were drug-resistant cases.

Management of SSP requires primarily intercostal chest tube drainage (ICD) and other treatment modalities as mentioned in (Table 7). In our study, all cases required ICD insertion except in three patients where pneumothorax was managed conservatively. The median duration for ICD in situ was 10 days.

All patients required oxygen supplementation with no need for mechanical ventilation. None of the patients had tension pneumothorax. There was no mortality during hospitalization. Antituberculosis treatment was started in patients with confirmed tuberculosis as per the National Tuberculosis Elimination Program guideline.

Fig. 1: Chest radiograph showing right-sided pneumothorax with bilateral upper and midzone progressive massive fibrosis and egg-shell calcification of mediastinal lymph nodes

Fig. 2: Chest radiograph showing left-sided pneumothorax with bilateral upper and midzone nodularity with progressive massive fibrosis

Half (43%) of the study population. This is similar to a study done by Meena et al. in Western Rajasthan, India.2 In another study by Mohebbi et al., the incidence of SSP was found to be 34% which was lower than the present study.6 Most of the patients in our study had unilateral pneumothorax as seen in other studies.2–6

In our study, 66% were smokers. As per the literature, smoking is a known risk factor for pneumothorax.8 No significant correlation between smoking with pneumothorax was observed in the present study (Table 6).

Patients with silicosis are at higher risk of pulmonary tuberculosis.9 We found that it was another common cause of respiratory worsening in silicosis patients and was seen in one-fourth of total admitted cases. CBNAAT for mycobacterium tuberculosis was superior to AFB stain in the diagnosis of tuberculosis in our study. There were 26 cases of smear-negative tuberculosis which showed positive CBNAAT. As per a study by Prakash et al. in smear-negative individuals, the sensitivity of CBNAAT is 80.9%.10 Three of all pulmonary tuberculosis patients were drug-resistant cases.

Management of SSP requires primarily intercostal chest tube drainage (ICD) and other treatment modalities as mentioned in (Table 7). In our study, all cases required ICD insertion except in three patients where pneumothorax was managed conservatively. The median duration for ICD in situ was 10 days. All patients required oxygen supplementation with no need for mechanical ventilation. None of the patients had tension pneumothorax. There was no mortality during hospitalization. Antituberculosis treatment was started in patients with confirmed tuberculosis as per the National Tuberculosis Elimination Program guideline.
**CONCLUSION**

The present study emphasizes evaluating all known silicosis patients for spontaneous pneumothorax if they present with worsening shortness of breath and or chest pain. The study found a high incidence of secondary spontaneous pneumothorax in such patients. A pneumothorax can be life-threatening in patients with silicosis as they already have poor pulmonary reserve and require immediate medical intervention.

**ACKNOWLEDGMENT**

Special thanks to the Late Dr R K Jenaw, Senior Professor, Institute of Respiratory Diseases, SMS Medical College, Jaipur, Rajasthan, India, for his persistent supervision, guidance, and valuable input for this research.

**REFERENCES**