



## Silicosis with Various Clinical Courses in a Tunnel Worker: A Case Report

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### Abstract

Author reports a case of 67- years- old men referred to Donga University Hospital silicosis who had worked in tunnel drilling where presumably had been exposed to high concentration free silica for almost 20 yr. This report is considered the first in Korea to the best of our knowledge since no cases on silicosis could be reported in this occupation in reviewing various literature sources in Korea. The physician's first impression was lung cancer since the CT findings. However, it turned out to be pneumonia and silicosis. It was eventually diagnosed with silicosis and pneumonia, and tuberculosis. The patient is suffering from various clinical courses for long time.

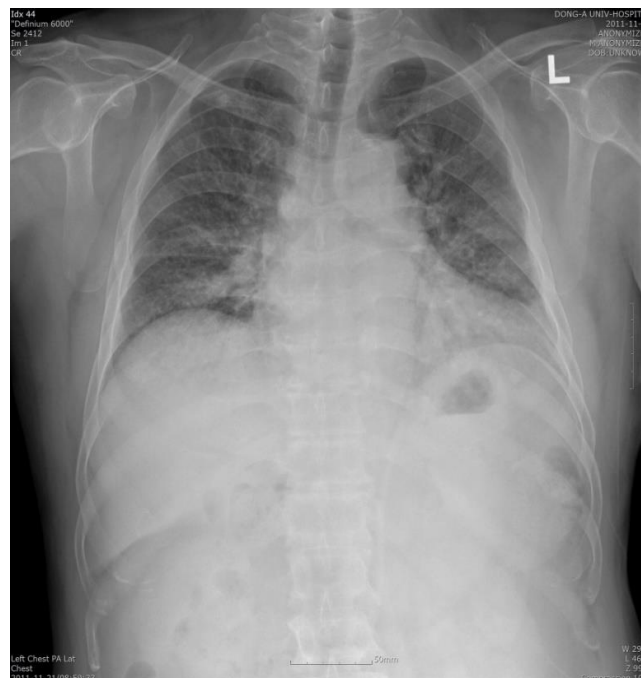
**Keywords:** Silicosis, Pneumoconiosis, Tunnel worker

### Introduction

In Korean industry that traditionally causes pneumoconiosis has been mainly metal and coal mining (1), so the miners were engaged in a public surveillance system but tunnel drillers were not some years ago. Silica is a major component of rock and sand, and tunnel drillers have potential exposure to silica (2). Tunnel excavation processes may have the high risk of the exposure to free silica. But cases have been rarely reported in Korea. Accordingly, since we found a case that a worker who had been working in the drilling process of the tunnel excavation for 20 years from 35 to 55 yr old, a 67- years- old men showed silicosis displaying various clinical aspects such as pneumonia, pulmonary edema, secondary infection along with a suspicious finding of cancer, herein we report the case.

### Case Report

In April 2010, a 67- years- old men referred to Donga University Hospital, South Korea complaining of continual cough for 8 yr.

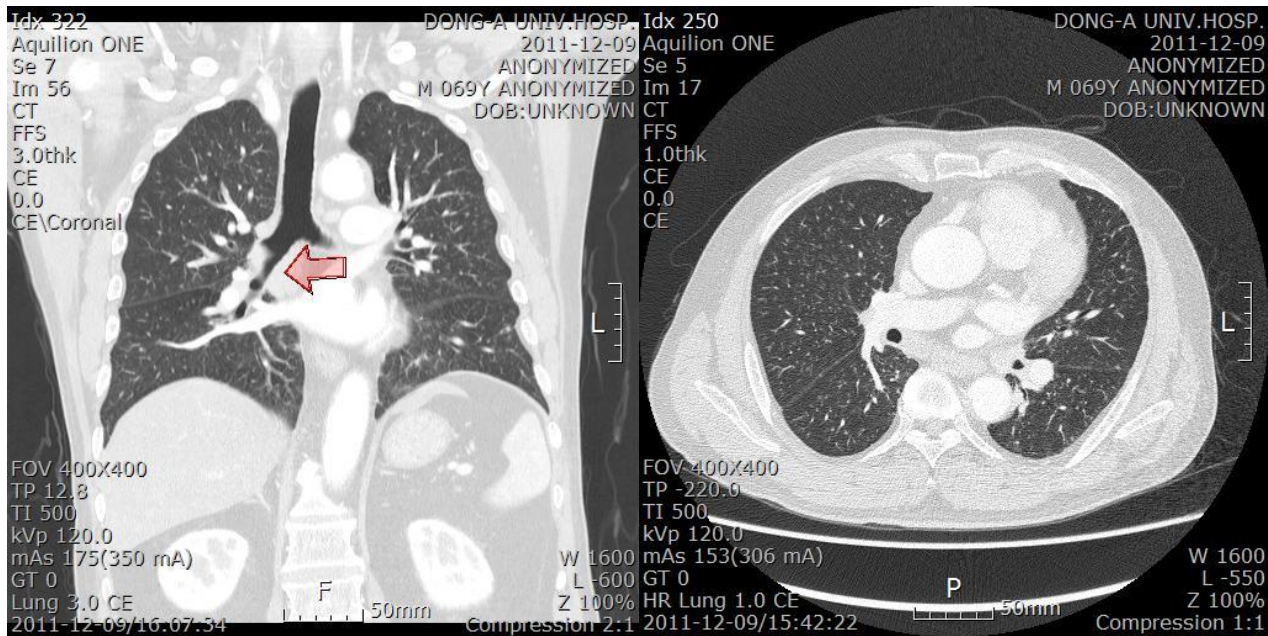


**Fig. 1:** Diffuse nodular opacity was seen on chest x-ray

The symptoms were more aggravated at night. The patient had been treated for hypertension and diabetes for 9 years. He had been never smoked. Wheezing sound was heard on his chest. Blood, urine and sputum test were unremarkable. Chest X-ray showed no specific finding. The forced vital capacity (FVC) was 80% and forced expiratory volume in one second (FEV1) 96%, FEV1/FVC (%) was 83%, indicating nearly with-

in normal range. He was recommended to visit hospital monthly.

In December 2011, on his chest x-ray, diffuse nodular opacity was seen (Fig. 1). In chest CT, peribronchial tumor infiltration was showed on bronchus intermedius and lymphohematogenous metastasis were showed in both lungs. Multiple metastatic lymphadenopathy also showed above mentioned area (Fig. 2).



**Fig. 2:** Peribronchial tumor infiltration was showed on bronchus intermedius and lymphohematogenous metastasis were showed in both lungs. Multiple metastatic lymphadenopathy also showed above mentioned area

In Positron Emission Tomography-Computed Tomography (PET CT) showed hypermetabolic bilateral mediastinal and perihilar lymph nodes and multiple nodules in both lungs. This suggested inflammatory change and/or metastasis (Fig. 3). However, bronchoscopic finding was nonspecific. Endobronchial lesion was not observed. The bronchial washing test gave negative results for acid-fast bacillus (AFB), AFB PCR (polymerase chain reaction), AFB culture test and microscopic cytology. Biopsy of lungs showed that malignant neoplasm was not found while fibrosis, anthracosis and silicosis were observed. Carcinoembryonic antigen (CEA) was 1.58 ng/ml,

which was at the normal level. Echocardiogram finding was nonspecific. As dyspnea was somewhat improved and negative malignancy, the patient was discharged.

In January 2012, he was admitted complaining of cough and chilling sense. On chest PA and CT, focal lobar pneumonia with distal bronchopneumonia, associated with mild pulmonary edema was observed in both lungs. The patient was diagnosed with pneumonia and silicosis, and was discharged since the dyspnea symptom was somewhat improved

In November 2013, he was admitted complaining of fever for 10 days. Silcotuberculosis was sug-

gested on BLL and RML of chest x-ray (Fig. 3). On chest CT, increased extent of well-defined centrilobular nodules with perilymphatic distribution, indicating aggravated state of pneumoconiosis was observed on both lungs. Multifocal patchy consolidation with ground glass opacity and ill-defined nodules were shown in RML and BLL, which indicating silicotuberculosis, multifocal pneumonia or reactive lymphadenopathy (Fig. 4). The AFB concentration was positive result and medication for tuberculosis was started. The patient was diagnosed with pneumonia, tuberculosis and silicosis, and was discharged since the a symptom was somewhat improved. In July 2015, small opacity was observed throughout the whole lung in plain chest radiographic images, interpreted to be pneumoconiosis (ILO classification t/q, 2/3, tb) (Fig. 5).



Fig. 3: Silicotuberculosis was suggested on RML and BLL

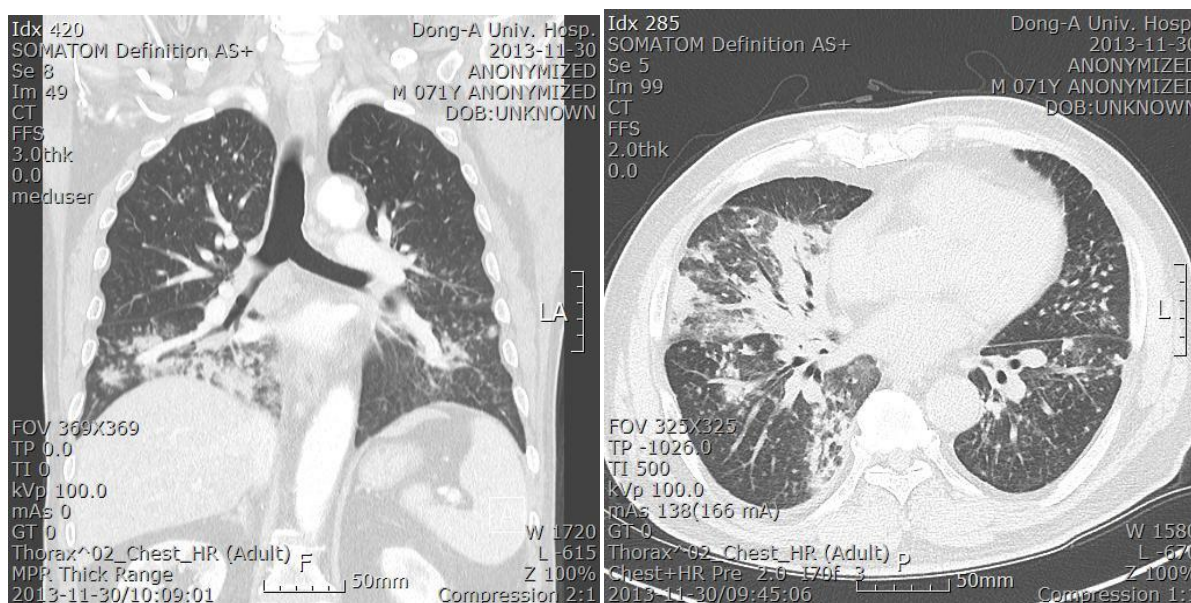


Fig. 4: Increased extent of well-defined centrilobular nodules with perilymphatic distribution, indicating aggravated state of pneumoconiosis was observed on both lungs. And multifocal patchy consolidation with ground glass opacity and ill-defined nodules were shown in RML and BLL, which indicating silicotuberculosis, multifocal pneumonia or reactive lymphadenopathy

## Discussion

Although the tunnel drilling causes silicosis by generating crystalline free silica, the actual reports of the occurrence in Korea could not be found in

any search. In addition, there have been only few reports in PubMed.

For all tunnel workers, the geometric mean exposure to total dust was  $3.5 \text{ mg/m}^3$  (GSD = 2.6), respirable dust was  $1.2 \text{ mg/m}^3$  (GSD = 2.4), and

alpha-quartz was  $0.035 \text{ mg/m}^3$  (GSD = 5.0), respectively (3). The mean exposure to respirable dust and alpha-quartz in tunnel workers varied from 1.2-3.6  $\text{mg/m}^3$  (respirable dust) and 0.019-0.044  $\text{mg/m}^3$  (alpha-quartz) depending on job task performed (4).

Latency and progressing pattern of silicosis vary according to concentration of inhaling dust and the accumulated exposure amount of dust (5). In this case, the symptoms started 39 yr after first exposure and the latency of radiologic change was 48 yr. A Japanese study, in the tunnel worker, the mean age at the first visit was  $58.60 \pm 7.10$  years.



**Fig. 5:** Small opacity was observed throughout the whole lung

The incidence rate of progression was 42 per 1,000 person-years with a median time to progression of 17 years. Progression was demonstrated among 33 cases (51%). The mean durations of progression from category 1 to category 4 and category 2 to category 4 were 14.55 and 10.65 years. Most patients (86%) had radiographic change from category 1 or 2 directly to category 4 (6).

The prevalence of tuberculosis is 101 per 100,000 in 2014 in Korea and highest rate in OECD (7). So, silicotuberculosis maybe not uncommon and is compensated by regulation in Korea.

Crystalline silica was classified as Group I by the International Agency for Research on Cancer (IARC) (8). If patients with silicosis smoke, the relative risk of lung cancer was 4.47 times higher (9). Tunnel work showed a significant relationship to lung cancer mortality. The SMR's of workers with dust exposure for lung cancer was 188 (10). Therefore, we must check up the retired person who worked in the tunnel in their lives.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

## Acknowledgments

The author declares that I have no competing interests.

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