Editorial

Do we still live under a silica rock?

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Pneumoconiosis is a disease caused by the accumulation of inhaled mineral dust in the lungs, which leads to lung dysfunction due to the reactions of the lung tissue (1). The changes which occur in the lungs depend on the different types of dust responsible. Fibrotic change including focal nodular or diffuse fibrosis is characteristic in radiological findings. Silica, asbestos, and coal are major causative among workers, such as miners and grinding workers. To reduce the risk of inhalation, many attempts have been made by the industries, the local governments, and international organization, such as the World Health Organization (WHO) and the International Labour Organization (ILO) (2-5).

Among the pneumoconioses, silicosis has become the most common type of pneumoconiosis recently (6,7). Silicosis is one of the fibrotic types of pneumoconioses caused by free silicon dioxide or silica. The crystalline form of silica is included in quartz, tridymite, and cristobalite, which are indispensable materials used in a wide array of industries. Since the primary prevention protocols to minimize exposure have progressed, the numbers of patients with asbestosis and coal workers' pneumoconiosis (CWP) have decreased gradually (8). This advancement was once expected to make pneumoconiosis a relic of the past. However, contrary to expectations, there still remain considerable numbers of patients with silicosis. The trends of the incidence of the patients vary among countries, and depend on the sociodemographic-index (SDI) (9). In moderate and low SDI regions, the cases of silicosis have increased over the last three decades, while in high SDI regions the cases of silicosis have not changed. However, two notable exceptions were observed, with marked increase in Australia and New Zealand.

The number of newly diagnosed cases of silicosis is affected by many factors. At first, screening protocol is different in each country. For example, the Thoracic Society of Australia and New Zealand recommended using lung function testing beyond spirometry including static lung volumes and diffusing capacity of the lung for carbon monoxide (DLCO) (3). They also incorporate high resolution computed tomography (HRCT) into their flowcharts to improve imaging sensitivity and specificity. Second, interpretation of radiologic findings is largely incomplete. Chest X-ray is usually included in routine screening protocols in many countries (4). However, the sensitivity and inter-reviewers agreement of chest X-ray in the early phases of silicosis is limited (10). Moreover, in some countries, the number of radiologists and pulmonary physicians who are involved in the screening process is insufficient (11). There is likely an indisputable number of cases that have passed the screenings without receiving accurate diagnoses. Third, the number of patients with artificial stone silicosis has increased recently. The quantities of crystalline silica used in artificial stone is much larger than in natural stone (12,13).

Artificial stone silicosis has been an emerging threat over 15 years especially in the developed countries (13). Occupations traditionally associated with silicosis include glass and pottery making, mining and quarrying, sandblasting, and the construction trade. In recent years, there have been

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significant number of patients with silicosis related to the use of high-silica content artificial stone materials used to produce kitchen and bathroom countertops (6). Artificial stone silicosis is characterized by the rapid progression of fibrotic change following exposure cessation (12). Several studies have reported a relatively high percentage of the patients with artificial stone silicosis presenting progressive massive fibrosis (PMF) at the time of diagnosis (12,13). PMF is a representative finding in chest X-ray and HRCT in the patients with silicosis, and its occurrence is associated with respiratory failure, lung transplantation, and even death.

In geometrical analysis, the highest incidence of patients adjusted by age was observed in China, Taiwan, and Singapore (6,9). In Asia, there are a wide range of industries associated with exposure to silica, including traditional occupations. Although the prevention methods have progressed, the demand for economic development results in the incidence of silicosis. In addition to these factors, patients in new technological fields, including jewelry and glass production, and use of nanomaterials are emerging.

In this issue of *Annals Palliative Medicine*, Song *et al.* showed the survival analysis of large number of pneumoconiosis cases in a region of China (14). Silicosis is the most common pneumoconiosis there, and occupies 68.5% of the patients. Longer dust exposure period, progressed fibrosis such as PMF at the time of diagnosis, and progressive fibrotic change during a follow-up period are three independent variables that predicted poor prognosis in their cohort. The mortality rate here was 19.9%, and higher than previous reports in other regions in China. One possible reason can be that this study included mostly silicosis patients. However, the authors assumed that dust concentration in these workplaces greatly exceeds the standard, and insufficient occupational health supervision, limited dust prevention technology, and the low coverage rate of occupational health examinations can be potential reasons, even though a considerable number of measures have been employed to protect workers against dust inhalation. There are valuable lessons to learn from this study. However, there are many clinical and epidemiological questions still left unanswered in this field.

Unfortunately, the published research papers on pneumoconiosis have decreased gradually over three decades. Searches in PubMed showed that 346 papers in 1990s, 319 papers in 2000s, and 279 papers in 2010s were found when using "pneumoconiosis" as the search term. For other interstitial lung diseases such as idiopathic pulmonary fibrosis, idiopathic interstitial pneumonitis, and hypersensitivity pneumonitis, the papers on those fields have increased during same period. Therefore, this raises concern about researcher apathy in this field.

Pneumoconiosis is not what it was a century ago. There might be huge new changes in this field despite fewer new papers being published compared to the other fields. We physicians, radiologists, environmental hygienists, and epidemiologists can never live under a rock anymore, and should catch up with the recent changes in this field.

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