

## Case Report of Asbestosis

Yong Hwan Lee<sup>1</sup>, Hee Kyung Chang<sup>2</sup>, Kiyoshi Sakai<sup>3</sup>, Naomi Hisanaga<sup>4</sup>,  
Yong Hyun Chung<sup>5</sup>, Jeong Hee Han<sup>5</sup> and Il Je Yu<sup>5\*</sup>

<sup>1</sup>Department of Preventive Medicine, <sup>2</sup>Department of Pathology, College of Medicine,  
Kosin University, Pusan, Korea

<sup>3</sup>Nagoya City Public Health Research Institute, Nagoya, Japan

<sup>4</sup>National Institute of Industrial Health, Kawasaki, Japan

<sup>5</sup>Center for Occupational Toxicology, Occupational Safety & Health Research Institute,  
Korea Occupational Safety & Health Agency, Daejeon, Korea

(Received August 6, 2001)

(Accepted September 10, 2001)

**ABSTRACT** : A patient, 58 years of age, with suspected 0/1 pneumoconiosis since 1993, complained of a dry cough and exertioning dyspnea for 6 months. He had worked in an asbestos company for more than 20 years from 1974. He was subsequently diagnosed with an interstitial lung disease during an annual special health check-up for asbestos workers. A chest X-ray showed an interstitial lung disease and high-resolution computed tomography (HRCT) showed a round opaque asbestosis with chronic hypersensitivity pneumonitis. A pulmonary function test indicated that the patient had a mild restrictive lung disease with FEV1 1.67 liters and 82% FEV1/FVC. The bronchoalveolar lavage fluid included many asbestos bodies, indicating previous exposure to asbestos. Transmission electron microscopy (TEM) using an energy dispersive X-ray analyzer (EDX) revealed many asbestos bodies consisting of mainly crocidolite fibers ( $6,071 \times 10^6$  fibers/g of dry lung). The patient had an unusually high asbestos content of  $6,112 \times 10^6$  asbestos fibers/g of dry lung.

**Key Words** : Asbestos, Asbestosis, Crocidolite, Chrysotile, Occupational disease

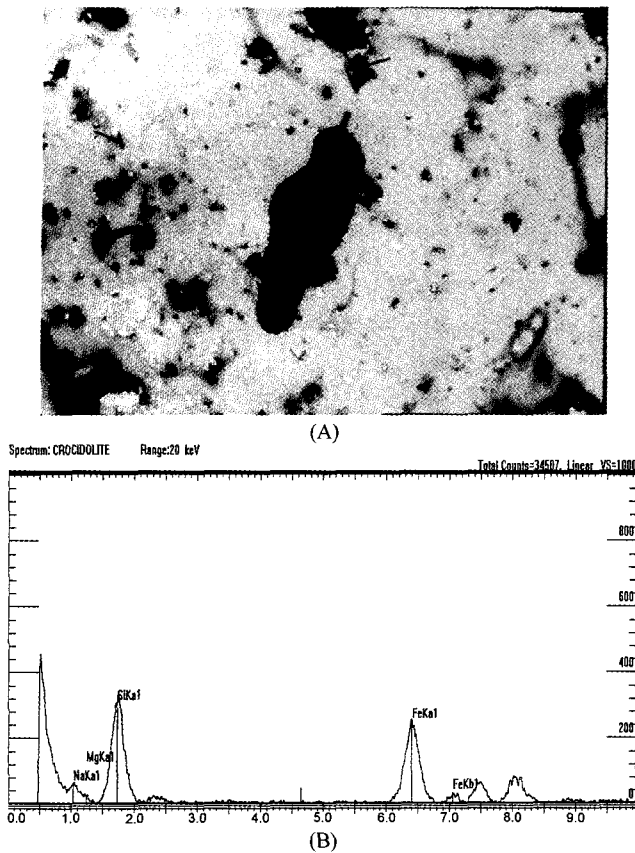
### I. INTRODUCTION

Asbestosis is defined as the bilateral interstitial fibrosis of the lungs caused by the inhalation of asbestos fibers (Churg and Green, 1998). This condition is the result of long-term exposure to asbestos dust and has a long latency period. Since the first discovery of asbestos-related lung cancer in 1994 (Jung *et al.*, 1994), relatively few cases of asbestos-related diseases have been reported among asbestos workers (Park *et al.*, 1995; Ahn *et al.*, 1997). Since the length of employment for asbestos workers in Korea is generally relatively short, it has been difficult to show a cause-effect relationship between asbestos exposure and disease.

However, a recent case of asbestosis, initially confirmed by a videoscope-assisted thoracoscopic biopsy (VATS), was diagnosed in a 58-year old man who had

been engaged in the production of asbestos textiles from 1974~1998 in an asbestos company with 25 employees. He was the longest employed employee in the company. The company began to install ventilation system from 1982-1983. Despite suspected pneumoconiosis discovered during an annual health check-up in 1993, he continued to work in his current job until recently. In January 1998, he experienced a cough and dyspnea and took drugs for tuberculosis, however, the symptoms were not relieved. In June 1998, he was diagnosed with an interstitial lung disease during an annual special health check-up for asbestos workers. The patient had not smoked for 35 years since his military service. A pleural friction rub was heard in both lower lung fields with auscultation. In an arterial blood gas analysis, the pH was 7.37, P<sub>O<sub>2</sub></sub> was 75.7 mmHg, P<sub>CO<sub>2</sub></sub> was 29.7 mmHg, HCO<sub>3</sub> was 15.6 mmol/l, and O<sub>2</sub> saturation was 97.3%. In a pulmonary function test, the FVC was 2.04 liters (72% predicted), FEV1 was 1.67 liters (72% predicted),

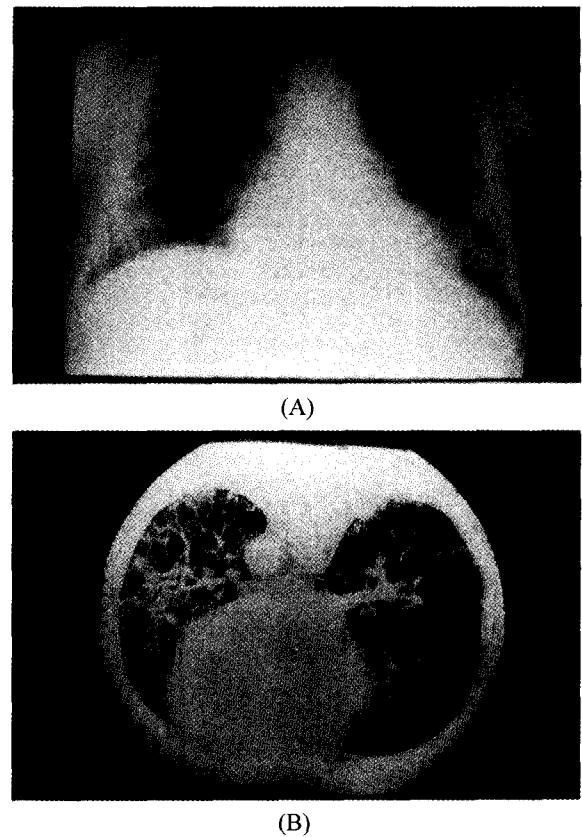
\*To whom correspondence should be addressed



**Fig. 1.** A. Asbestos body observed by electron microscopy ( $\times 6,000$ ). B. EDX analysis of fiber of asbestos body.

FEV1/FVC was 82% (81% predicted), and  $DL_{CO}$  was 13.14 ml/min/mmHg (62% predicted). The bronchoalveolar lavage fluid and lung biopsy both included many asbestos bodies, indicating previous exposure to asbestos (Fig. 1A, B). A plain chest radiograph showed a lot of tiny nodular densities and increased interstitial markings in both lower lung fields. The chest radiograph also showed pleural thickening and short transverse lines in the left lower lateral chest wall (Fig. 2A). An HRCT showed multiple irregular interlobular septa thickenings, ground-glass appearances, and a relatively distinct white line internal to the left posterior rib representing pleural thickening (Fig 2B). When performing a VATS, the whole lung and pleura showed white patches and the whole lung was adhered (figure not shown).

The concentration of asbestos fibers in the lung tissue of the patient was measured using TEM-EDX and found to be  $6,112 \times 10^6$  fibers/g of dry lung tissue. In a fiber analysis as determined by TEM-EDX, the amount



**Fig. 2.** A. Chest X-ray. Ground glass opacities seen in left lower lung field. B. HRCT at level of lung base. Parenchymal band and ground glass opacities with irregular interlobular septa thickening can be seen in left lower lung field.

of crocidolite was  $6,071 \times 10^6$  fibers/g of dry tissue, while the level of chrysotile was  $40.6 \times 10^6$  fibers/g of dry lung tissue.

Although many cases of asbestos-related diseases have already been reported worldwide, this is not a common occupational disease in Korea. The patient in the current case report had an occupational history of exposure to asbestos for more than 20 years, all the clinical signs, including dyspnea, a pleural friction rub in both lower lung fields, and the findings of the chest radiograph and HRCT, suggested asbestosis. For an accurate diagnosis of diffuse infiltrative lung diseases, a surgical lung biopsy using VATS (Xegdi *et al.*, 1998) was found to be a safe and effective procedure, and easily detected pleural plaque. The patient was also diagnosed as having lung fibrosis through a histopathological examination (Fig. 3) and the histological section revealed many asbestos bodies in the lung parenchyme. The number of asbestos



**Fig. 3.** Histopathology of lung biopsy specimen. Fibrosis can be seen near pleural surface.

fibers in the lung tissue of this patient was  $6,112 \times 10^6$  asbestos fibers/g of dry lung tissue, compared to  $0.3 \times 10^6$  asbestos fibers/g of dry lung tissue in the general Korean population (Yu *et al.*, 1998). The company where the patient worked, which was established about 25 years ago, claimed that they only used chrysotile asbestos. There was no clear recollection of when the company stopped using crocidolite asbestos and introduced chrysotile asbestos. After the ban on the use and import of amosite and crocidolite in Korea in 1995, the use of these materials was strictly prohibited (MOL, 1999). However, due to the widespread use of asbestos in Korea for more than 30 years, it is likely that diseases caused by asbestos

may surface in the near future in great numbers.

## REFERENCES

- Ahn, C.S., Kim, S.J., Oh, S.J., Park, K.J., Kim, H.J., Ahn, C.M., Kim, H.K., Shin, D.H., Cho, S.H., Yang, K.M. (1997): Pulmonary asbestos: radiologic-pathologic brief report. *Yon. Sei. Med. J.*, **38**, 323-326.
- Churg, A., Green, F.H.Y. (1998): Pathology of occupational lung disease. Second edition, pp. 313-338. Williams & Wilkins Second edition, Baltimore.
- Jung, J.Y., Ahn, H.S., Kim, J.W., Kim, K.A., Yun, I.G., Kim, H.W., Choi, Y.M., Song, J.S. (1994): A case of asbestos pleural effusion and lung cancer caused by long-term occupational asbestos exposure. *Korean J. Tuberc. Respir. Dis.*, **41**, 651-7.
- Ministry of Labor (MOL) (1999): Industrial Safety and Health Act, Enforcement Decree, Article 29, Republic of Korea.
- Park, M.I., Choi, J.S., Choi, H.M., Jang, T.I., Moon, I.H., Kim, J.H., Jang, T.W., Lee, D.H., Jung, M.H., Kang, S.K. (1995): A case of diffuse malignant pleural mesothelioma with occupational exposure. *Korean J. Med.*, **48**, 526-530.
- Xegdi, R., Azorin, J., Trmblay, B., Destable, M.D., Lajos, P.S., Valeyre, D. (1998): Videothoracoscopic lung biopsy in diffuse infiltrative lung diseases: a 5-year surgical experience, *Ann. Thorac. Surg.*, **66**, 1170-1173.
- Yu, I.J., Moon, Y.H., Sakai, K., Hisanaga, N., Park, J.D. and Takeuchi, Y. (1998): Asbestos and non-asbestos fiber content in lungs of Korean subjects with no known occupational asbestos exposure history, *Environmental International*, **24**, 293-300.