

## Pleural Mesothelioma after Neighborhood Exposure to Asbestos during Childhood

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**A 38-year-old woman with pleural mesothelioma who had a history of neighborhood asbestos exposure during her childhood was demonstrated. She had no known history of occupational asbestos exposure. This is the first case of mesothelioma with neighborhood asbestos exposure reported in Japan. Previously-reported cases of mesothelioma with neighborhood asbestos exposure in the English language literature were reviewed.**

**Key words:** Asbestos-related disorder, Non-occupational asbestos exposure, Asbestos body

Pleural mesothelioma usually develops in workers with a history of occupational asbestos exposure. However, this tumor is known to occur after non-occupational asbestos exposure, which includes domestic and neighborhood exposure. Here a female case of pleural mesothelioma with a history of neighborhood asbestos exposure during her childhood is reported.

### CASE REPORT

A 38-year-old woman was referred to the outpatient clinic of our hospital on October 27, 1979 because of right chest pain. She was well until the beginning of September 1979, when she noticed a sharp pain in the right chest and a non-productive cough. The chest pain gradually increased and did not subside even after the prescription of an analgesic by her family doctor.

She was born in 1941 at Ube, Yamaguchi, and lived there until the age of four. There were some cement plants, factories of nitrogen compounds, and a coal mine within one kilometer of her house. The roof of her house was always covered with white dust and it was difficult to hang out the washing to

dry because of the white dust in the air. Her mother worked in a cement plant, and she usually took her to the factory and let her play on the white dust covered hills. She left the district and had no known asbestos exposure during the subsequent 34 yr.

Physical examination was normal except for diminished breath sounds in the right chest. Laboratory data was as follows: erythrocyte sedimentation rate, 22 mm in 1 h; hemoglobin, 12.4 g/dl; hematocrit, 37.5%; leukocyte count, 5,400/mm<sup>3</sup> with a slight left shift; platelet count, 307 × 10<sup>3</sup>/mm<sup>3</sup>; serum total protein, 7.5 g/dl with albumin of 58.6%,  $\alpha_1$ -globulin 4.4%,  $\alpha_2$ -globulin 8.5%,  $\beta$ -globulin 9.4%, and  $\gamma$ -globulin 18.8%. The following values were normal: serum urea nitrogen, creatinine, uric acid, sodium, potassium, chloride, calcium, phosphate, magnesium, lactic dehydrogenase (LDH), glutamate oxaloacetic transaminase (GOT), glutamate pyruvic transaminase (GPT),  $\gamma$ -glutamyl transpeptidase ( $\gamma$ -GTP), alkaline phosphatase, total bilirubin, creatinine phosphotransferase (CPK), and fasting blood glucose. Arterial blood gas analysis showed a pH of 7.42, Pco<sub>2</sub> 37.4 Torr, Po<sub>2</sub> 76.7 Torr, total CO<sub>2</sub> 25.4 mEq/l, and

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SaO<sub>2</sub> 94.5%. Chest X-ray revealed a right pleural effusion and a calcification beneath the right hemidiaphragm (Fig. 1). Aspirated pleural fluid was yellow and turbid, which had a white cell count of 8,800/mm<sup>3</sup> (56% histiocytes, 22% lymphocytes, and 21% serosal cells), protein of 4.3 g/dl, glucose of 100 mg/dl, and LDH of 164 U/l. Gram and Ziehl-Neelsen stains on the fluid failed to demonstrate any micro-organisms and cytological examination revealed no malignant cells. However, pleural biopsy specimen showed malignant pleural

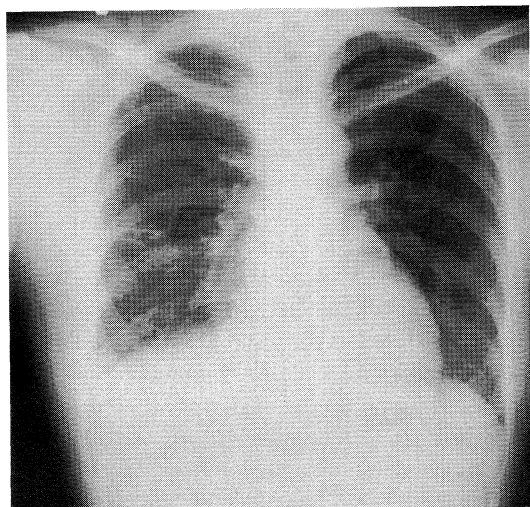


Fig. 1. Chest X-ray on admission shows right pleural effusion and calcification beneath the right hemidiaphragm.

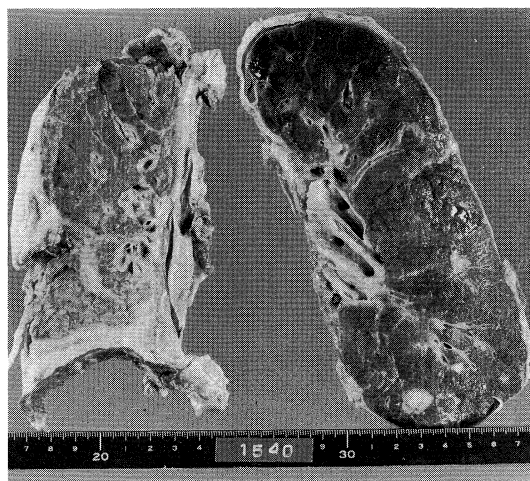


Fig. 2. The tumor occupies the right pleural cavity and invades the diaphragm and the chest wall.

mesothelioma of the epithelial type. The patient underwent some intrathoracic chemotherapies but she died in September 1980.

Postmortem examination showed a diffuse pleural tumor in the right pleural cavity, encasing the right lung and invading the diaphragm and the chest wall (Fig. 2). Metastases of the tumor were seen in the mediastinal, both hilar, and caliac lymph nodes, the left pleura, and the peritoneum through the diaphragm without hematogenous spread. Histologically the tumor showed a mixed-type malignant mesothelioma composed of the epithelial cell type and spindle-cell sarcomatous type (Fig. 3). Ultrastructure of the tumor cells of sarcomatous type showed characteristic intermediate filaments in the cytoplasm surrounding the round nucleus with a large nucleolus (Fig. 4).

To identify and quantify the asbestos body in the lung, the method of Smith and Naylor (1) was used. The principle is to digest the tissue in sodium hypochlorite and to extract the solid residue on a membrane filter. From the fixed pulmonary tissue weighing 1.82 g, we found 517 asbestos bodies/g by microscopy (Fig. 5).

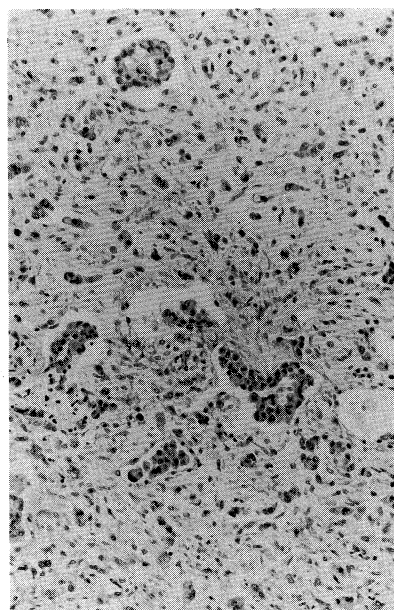


Fig. 3. Histologically the tumor is mixed-type malignant mesothelioma composed of epithelial type and spindle-celled sarcomatous type cells. HE×200.

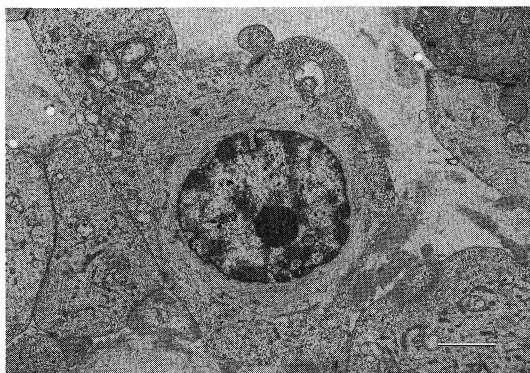


Fig. 4. Ultrastructure of the sarcomatous mesothelioma cell. Numerous intermediate filaments can be seen in the cytoplasm around the nucleus. Bar = 2  $\mu$ m.

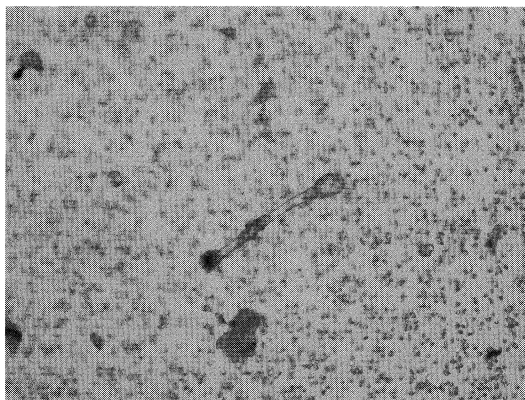


Fig. 5. Asbestos body in a digest of fixed pulmonary tissue. Membrane filter preparation, unstained  $\times 40$ .

## DISCUSSION

Mesothelioma with asbestos exposure outside of an industrial plant, namely neighborhood exposure, was first recognized by Wagner et al (2) in 1960. In the review of 33 cases of mesothelioma in South Africa, they described 14 patients with neighborhood exposure, who lived near a mine or who played on mine dumps as children. Since then several studies of mesothelioma, including cases with neighborhood exposure, have been reported in South Africa (3, 4). In England, Newhouse and Thompson described 11 patients with mesothelioma who lived within a half mile of an asbestos factory (5). Greenberg and Davies, in a large study of 243 cases of mesothelioma, reported 13 cases with neighborhood

exposure, and described the nature of exposure in each case (6). In the United States, Lieben and Pistawka, in the study of 42 cases of mesothelioma reported from 152 hospitals, described eight patients who lived or worked close to an asbestos industry (7). In Italy, Rubino et al reported one patient with mesothelioma who lived within a hundred meters of an asbestos textile plant (8). In Japan, there have been no complete reports (abstracts only) of cases of mesothelioma with neighborhood exposure to asbestos. The patient of the present report had no known asbestos exposure other than neighborhood exposure on the white dump in the cement plant during her first 4 yr of life, and she developed mesothelioma at the age of 38.

The history of her neighborhood exposure during childhood was obtained from her relative by repeated interviews confirming the details. The importance of history-taking of asbestos exposure has been emphasized in some reports (9). Asbestos exposure may be established as a factor in the development of mesothelioma, if a careful history is obtained by physicians.

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