CARCINOMA OF THE LUNG AND SILICOSIS: PATHOLOGICAL STUDY

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INTRODUCTION

The relationship between silicosis and lung carcinoma can be approached from both epidemiologic and morphologic viewpoints. The majority of epidemiologic studies indicate that lung carcinoma occurs less frequently in coal miners than in comparable populations. However, excess lung carcinoma has been reported among metal miners, pottery workers, foundry workers and silicotic patients.

To our knowledge, detailed morphologic studies of lung carcinoma in silicotic patients have not been reported.

This is a report on pathologic evaluation of lung carcinoma associated with silicosis which was reviewed between 1960 and 1986 at our Laboratory.

MATERIALS AND METHODS

Between 1960 and 1986, the authors evaluated about 450 autopsies of silicosis. Of these, 140 were our own consecutive autopsies in our Laboratory and remaining 310 were kindly provided to us from other hospitals in Japan. Carcinoma of the lung was seen in 48 of the autopsies.

Pathological studies, including cell types, cancer sites, severity of silicosis, were performed in the 48 cases of lung carcinoma associated with silicosis.

Severity of silicosis was determined by extent of progressive massive fibrosis as follows; (1) mild silicosis; silicosis without PMF (simple silicosis); (2) medium silicosis: silicosis with small PMF that were formed within lung segment; (3) severe silicosis: silicosis with large PMF including some segments.

RESULTS

Carcinoma of the lung was seen in 25 of our own consecutive autopsies, an incidence of 19.9%. The incidence of lung carcinoma was definitely elevated among mild silicosis and lowered among severe silicosis (Table I).

Table II shows the distribution of lung carcinomas by histologic cell type in all 48 lung carcinomas.

Over all, the predominant cancer was squamous cell carcinoma (54.2%) followed by small-cell carcinoma (22.9%) and adenocarcinoma (14.6%). There was a clear trend of squamous cell carcinomas arising in the larger airways, whereas the adenocarcinoma was found only in peripheral lung tissue.

More tumors were observed in the right lung, but the difference was not observed between upper and lower lobes (Table III). In case of mild silicosis, the majority of tumors arose in the right, upper and larger airways. On the other hand, in case of medium and severe silicosis, more tumors arose in the left, lower and peripheral lung tissues.

The distribution of primary focus in the large bronchi are illustrated in Figure 1. In case of mild silicosis, many tumors arose in stem and lobar bronchi, whereas many tumors arose in segmental bronchi in case of medium and severe silicosis.

In case of silicosis with PMF, the majority of tumors arose in the segmental bronchi leading to PMF. (Figure 2 shows the typical case of such cases.)

The primary foci of tumors arising in peripheral lung tissues were illustrated in Figure 3. Almost all the tumors in periph-

Table I

Incidence of Lung Carcinomoma Among Our Autopsy Cases

Severity of Pn.	Number of Cases	Lung Carcinoma	%
Mild	40	13	32.5
Medium	51	10	19.6
Severe	49	2	4.1
Total	140	25	17.9

Table II

Distribution of Lung Carcinoma Associated with Pneumoconiosis Cases by Histologic Type

	Central Type	Peripheral Type	Unknown	Total	%
Squamous Cell Ca.	15	10	1	26	54.2
Adenocarcinoma	0	6	1	7	14.6
Small-Cell Ca.	6	4	1	11	22.9
Large-Cell Ca.	2	1	1	4	8.3
Total	23	21	4	48	100.0

Table III

Location in Lung of Tumors by Site of Origin

	Mild Pn.	Medium Pn.	Severe Pn.	Medium+Sever	Total
Right:Left	16: 7	7: 7	4: 3	11: 10	27: 17
Upper:Middle:Lower	14: 0: 9	5: 1: 8	4: 0: 3	9: 1: 11	23: 1: 20
Central:Peripheral	14: 9	7: 7	2: 5	9: 12	23: 21
Total	23	14	7	21	44

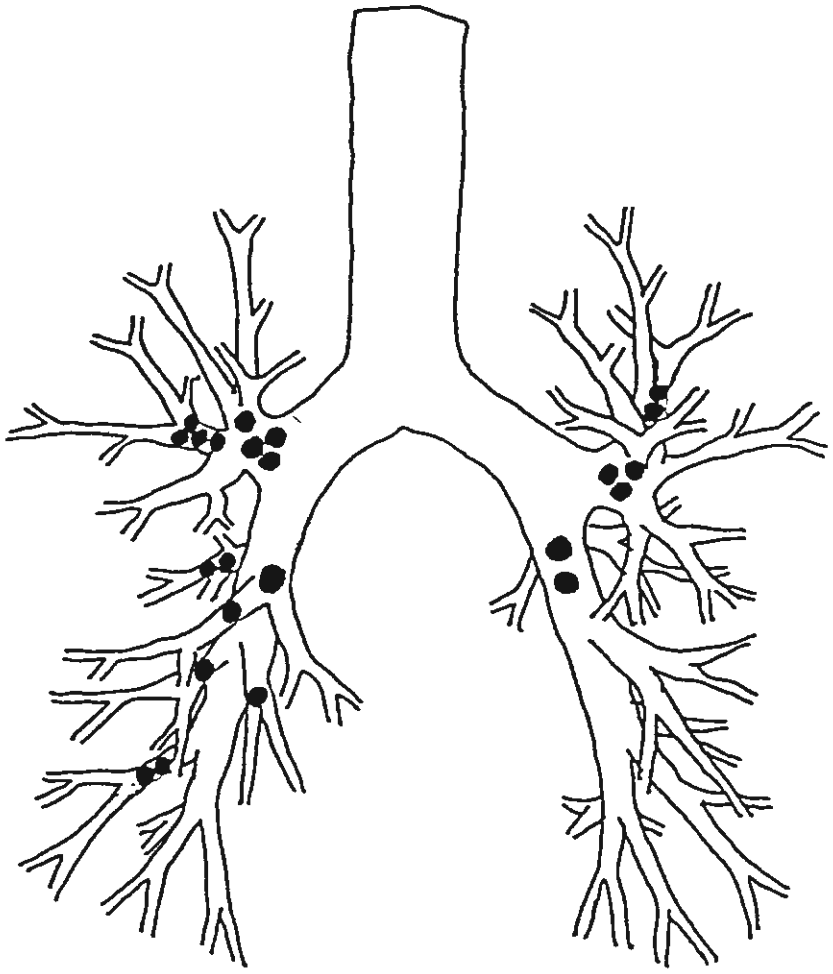
eral lung tissues arose in S_2, S_3, S_6, S_9 where PMF were usually formed.

The majority of the tumors in peripheral lung tissues were centered on closely adjacent to PMF or originated on the basis of pathologic course to PMF. In these cases, there were three cases of scar cancer arising in scar tissues of PMF (Figure 4 and Figure 5).

Diffuse interstitial fibrosis of the lung was often associated with silicosis. Five cases of carcinoma of lung were found in these cases (Figure 6).

SUMMARY

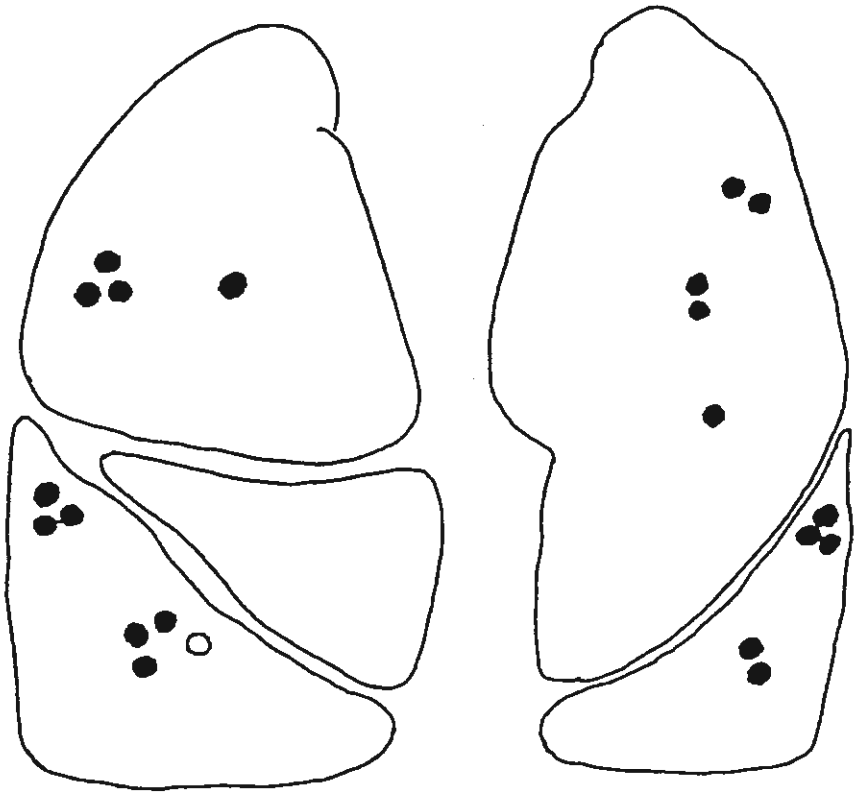
The data indicate the close relationship between pathological, changes of lung tissues by dust exposure and carcinoma of the lung.



	Right Lung	Left Lung
Upper Lobe Bronchus	4	3
Lower Lobe Bronchus	1	2
B_2 (B_{1+2})	4	2
B_4	1	0
B_6	2	0
B_7	1	0
B_8	1	0
B_9	2	0
Total	16	7

Figure 1. Location in bronchial trees of central type of tumors by site of origin.

Figure 2. Squamous cell carcinoma originated from bronchus leading to progressive massive fibrosis.



	Right Lung	Left Lung
S_2 (S_{1+2})	3	2
S_3	1	2
S_4	0	1
S_6	3	3
S_7	1	—
S_8	3	2
Total	11	10

Figure 3. Location in lung of peripheral type of tumors by site of origin.

Figure 4. Scar cancer originated from anterior portion of progressive massive fibrosis.

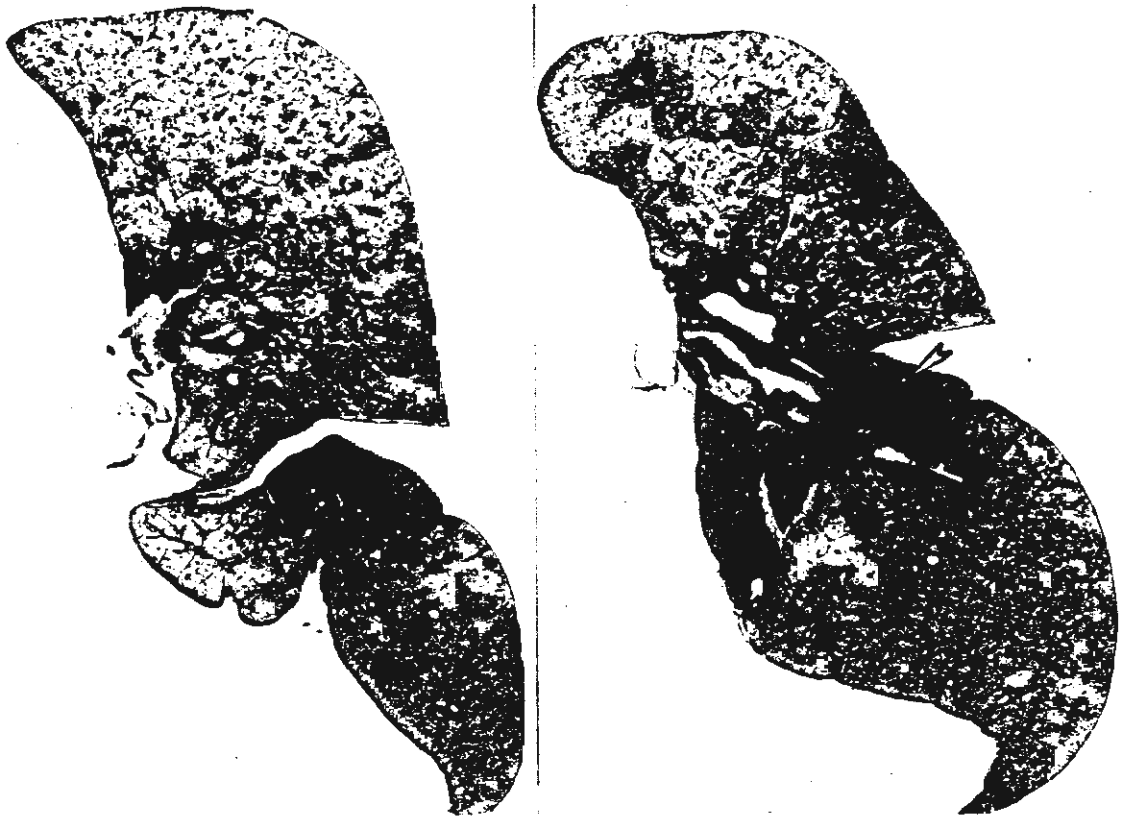


Figure 5. Scar cancer originated on the basis of pathologic course to progressive massive fibrosis.

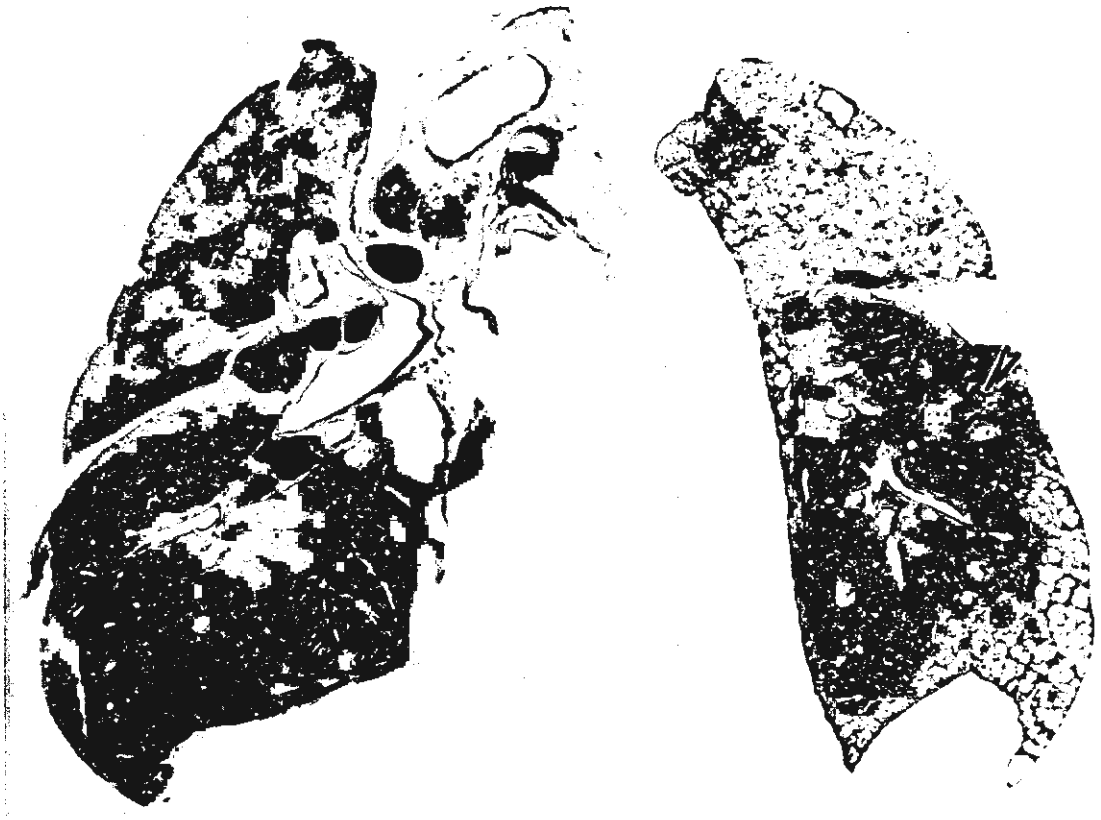


Figure 6. Adenocarcinoma associated with mild pneumoconiosis and diffuse interstitial fibrosis.

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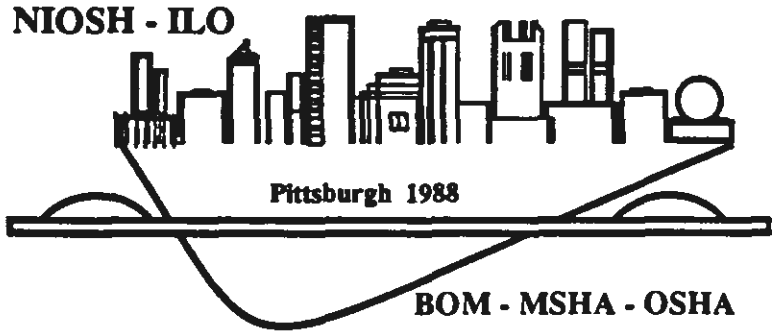

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