MALIGNANT PLEURAL MESOTHELIOMA IN MONFALCONE, ITALY

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INTRODUCTION

The Trieste and Monfalcone shipyards, northeastern Italy, represents the most important shipbuilding installations in the Mediterranean area. A high incidence of asbestos-related pleural mesothelioma has been reported from the Trieste Province, the large majority of the patients having been exposed in the shipyard.[2,3,9] At the Hospital of Monfalcone an investigation into pleural mesothelioma has been under way since October 1979.[5,6,8] The Monfalcone Hospital serves as a small coastal area with a total population of about 60,000.

MATERIALS AND METHODS

Forty seven cases of malignant pleural mesothelioma were observed at the Monfalcone Hospital between October 1979 and March 1988. The diagnosis was based on (or confirmed by) necropsy findings in 37 cases. In a further 6 cases, mesothelioma was diagnosed on material obtained at pleurectomy. In the remaining cases the pathology diagnosis was performed on pleura needle biopsy specimens (2 cases), or by cytological examination of the pleural fluid (2 cases). Detailed lifetime occupational histories were obtained from the patients themselves or from their relatives by personal interviews. In 36 cases, seen at necropsy at our laboratory, the thoracic cavity was carefully examined for hyaline pleural plaques; these were classified into 3 classes: 1, mild; 2, moderate; and 3, severe. The small plaques (few centimeters in major diameter) were defined as class 1. Very large plaques, involving the major part of a hemithorax were classified as class 3. The intermediate conditions were labelled as class 2. In expressing the results, sometimes the terms small and large plaques are used, "small" corresponding to class 1, and "large" including classes 2 and 3. In necropsy cases isolation and quantitation of asbestos bodies were performed after chemical digestion of lung tissue.[24] Samples were obtained from the base of the right lung or from the left base, when the right was largely involved by the tumor.

RESULTS

The series included 40 men (age range 46–89 years) and 7 women (age range 48–89 years) (Table I).

The large majority of the male patients had been exposed to asbestos in the shipbuilding industry, Navy, Merchant Navy, and insulation (Tables II and III). Of the remaining three men, the first had been employed in the Monfalcone sodium carbonate factory, a workplace where asbestos exposure certainly occurred in the past;[7] the second had been exposed to a joiner and welder in a repair workshop; the third patient had worked for some years in a dye-house, where "fireproofed textile fabrics for naval furniture," were dyed. Of the women, five patients had been exposed to asbestos at home, having cleaned the work clothes of their relatives, employed in shipbuilding or in the chemical industry. One patient had a mixed (occupational and domestic) exposure. Concerning the woman with "negative" history, it should be noted that she had spent the first twenty years of her life in a coastal city; during that period she lived near a large dockyard.

The duration of the exposure to asbestos was generally over 20 years (Table IV); however some subjects had been exposed for shorter periods, one patient having worked as a painter in the shipyard for only a few months. Only 3 subjects had their first exposure after 1950 (Table V). The latency periods, defined as intervals between the presumable time of the first exposure to asbestos and the time of the diagnosis, ranged from 20 to 63 years (Table VI).

At necropsy the large majority of the patients showed hyaline pleural plaques (Table VII). Lung asbestos bodies ranged between 100 and about 10,000,000 per gram of dried tissue, with 21 subjects having more than 10,000 asbestos bodies/gram (Table VIII).

The most severe stigmata of asbestos exposure were found in the two insulators, the former of whom showed large pleural plaques and more than 4,000,000 asbestos bodies per gram of dried lung tissue; in the latter about 10,000,000 asbestos bodies/g were isolated and no plaques were seen. Of 25 shipyard workers seen at necropsy, 22 showed large pleural plaques; no plaques were observed in two subjects and small plaques in one. The majority of the shipyard workers, namely 12, showed asbestos body counts ranging between 10,000 and 100,000/g; higher amounts (100,000–1,000,000) were found in 6 cases, and figures less than 10,000 in 7. Some thousands of asbestos bodies/g were isolated in two sailors (4,000 and 7,000 respectively), the former with large and the latter with small pleural plaques. The textile industry worker showed 5,000 asbestos bodies/g and small plaques. Of 5 women with histories of domestic exposure, two showed large pleural plaques, and a further two small plaques. In this group, one patient had an unexpectedly high amount of asbestos bodies (90,000/g), the figures ranging between 100 and 6,000/g in the remaining cases. Finally the patient with "negative" history did not show pleural plaques; the amount of asbestos bodies in this case was 600/g.

The histological examination of lung tissues obtained at

Table I
Sex and Age Distribution in 47 Cases of Malignant Pleural Mesothelioma

Age (years)	Men	Women	Total
45 - 49	3	1	4
50 - 54	2	0	2
55 - 59	4	1	5
60 - 64	2	0	2
65 - 69	9	0	9
70 - 74	8	2	10
75 - 79	8	0	8
80 - 84	2	2	4
85 - 89	2	1	3
Total	40	7	47

Table II
Asbestos Exposures: Occupational Data

	No. of cases
MEN	
Shipbuilding industry	30
Navy and merchant navy	5
Insulation	2
Chemical industry	1
Construction industry	1
Textile industry	1
WOMEN	
Domestic exposure	5
Mixed exposure*	1
Negative history	1

* Occupational (shipyard) and domestic

Table III
Trades of the Shipyard Workers

	No. of cases		No. of cases
Painter	4	Calker	1
Plumber	4	Electrician	1
Shipwright	4	Laborers	1
Mechanic	3	Riveter	1
Carpenter	2	Sheet metal worker	1
Joiner	2	Various	2
Welder	2	Unknown	1
Worker	2		

Table IV

Duration of Asbestos Exposure

Years	Men	Women	Total
0 - 4	1	0	1
5 - 9	5	0	5
10 - 19	1	0	1
20 - 29	9	3	12
30 - 39	13	3	16
40 - 49	11	0	11
Total	40	6	46

Table V

First Exposure to Asbestos

Calendar years	Men	Women	Total
1920 - 1929	12	4	16
1930 - 1939	17	1	18
1940 - 1949	8	0	8
1950 - 1959	2	0	2
1960 - 1969	1	0	1
Undetermined	0	1	1
Total	40	6	46

Table VI

Latency Periods (First Exposure—Diagnosis)

Years	Men	Women	Total
20 - 29	3	0	3
30 - 39	3	0	3
40 - 49	13	0	13
50 - 59	16	4	20
60 - 69	5	1	6
Undetermined	0	1	1
Total	40	6	46

Table VII
Hyaline Pleural Plaques in 36 Necropsy Cases

Pleural Plaques	Men	Women	Total
Absent	3	2	5
Class 1	3	2	5
Class 2	5	1	6
Class 3	19	1	20
Total	30	6	36

Table VIII
Lung Asbestos Bodies in 36 Necropsy Cases

AB *	Men	Women	Total
2 - 3	0	2	2
3 - 4	10	3	13
4 - 5	12	1	13
5 - 6	6	0	6
6 - 7	2	0	2
Total	30	6	36

* Asbestos bodies, Log10/g dried tissue

necropsy revealed a variable degree of pulmonary asbestosis in 31 of 36 cases. Multiple tumors were observed in 7 necropsy cases. In particular three additional malignancies, beside mesothelioma, were found in a 77-year-old man: stomach adenocarcinoma, chronic lymphocytes leukemia, and prostate microelectronic. A further three men showed prostate microcarcinomas, and one man had chronic lymphocytes leukemia. Among women, NOS infiltrating breast carcinoma was associated with the mesothelioma in one case. Moreover another patient had been successfully treated for infiltrating breast carcinoma two years previously.

DISCUSSION

In the epidemiology of malignant mesothelioma more serious difficulties are encountered than in the generality of other malignancies.[10] Recent investigations carried out in the U.S.A. show that the reliability of death certificates may be very scarce.[11,18,23] On the other hand, the histological diagnosis itself is not always reliable, the percentages of diagnoses confirmed by panels of expert pathologists being sometimes very low.[25] At any rate the high incidence of malignant pleural mesothelioma in shipyard areas belongs to the category of the well established facts in the geography of mesothelioma[3,9,11,12,16] The low numbers of mesotheliomas in some shipbuilding countries of Eastern Asia such as Japan,[21] Hong Kong,[17] and Singapore,[13] seem at variance with the above statement. However, it must be noted that in some of these regions industrialization is a recent process, so that a sufficient time may not have elapsed to allow the development of many mesotheliomas. Concerning Japan, certainly a long-established industrial power, the use of asbestos was minimum in this country until 1950, reaching important values only in the 1960's.[22]

In the Monfalcone area, the relationship with shipbuilding represents the most important characteristic of pleural mesothelioma, working in the shipyard accounting for the large majority of the cases. The risk is not confined to few trades. On the contrary, among shipyard workers practically all the occupational categories are involved, a fact already well documented.[3] In addition, "shipyard asbestos" is responsible for further cases, by inducing pollution of the domestic environment.

Asbestos exposure sufficient to induce the development of malignant mesothelioma may occur in a variety of workplaces, other than shipyards.[3,8,9,12,14,15,19,20] Maritime trades emerge as important occupations at risk in the present as well as in other mesothelioma series.[9] However, for

other occupations, the existence of a previous exposure to asbestos may be more difficult to determine. Some histories in the present series were judged as negative or uncertain at a first examination, and occupational asbestos exposure could be ascertained only be deeper inquiries. In fact the characteristics of a given workplace, as they were some forty-sixty years ago, are not simple to reconstruct, especially when this workplace is a small workshop. Obviously the objective data (pleural plaques, asbestos body amount, lung asbestosis) are of enormous importance in such a reconstruction.[7,8]

The dangers related to the large use of asbestos in the industrial world have not been sufficiently appreciated.[1] The data collected in Monfalcone as well as in other Western shipyard areas, have serious implications. Shipyard mesothelioma represents a particular "enhanced model" of asbestos-related malignancy. It is presumable that the situation which occurred in Western shipyard areas in the past has been repeated, although to a lesser extent, in a variety of workplaces during the last decades. This means that an epidemic of mesotheliomas might involve all the industrial world in the coming years. If large numbers of persons have been seriously exposed to asbestos in recent years, then all the possibilities of preventing the development of mesothelioma in such people should be explored.[4,5] In this context it is important that the mechanisms implied in the genesis of mesothelioma are clarified. In asbestos-related mesothelioma the main agent is well known. However, the other concurring factors, presumably playing some role in the genesis of the tumor, remain to be identified.[4,5] The role of environmental coveters such as nitrosamines have been hypothesized. On the other hand host factors have to be considered, and immune impairment, favored by asbestos itself and/or induced by other causes could be of critical importance. Such aspects should be included among the main objectives of the future research on mesothelioma.

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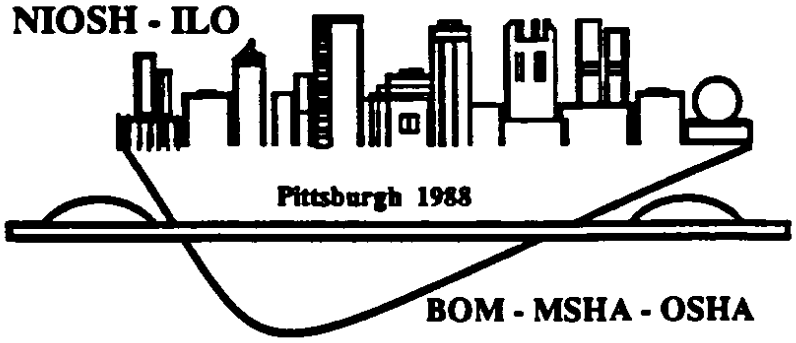

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