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Mesothelioma in Relation to Asbestos Fibre Exposure

A Review of 70 Serial Cases

J. C. COCHRANE, I. WEBSTER

SUMMARY

Seventy consecutive patients suffering from mesothelioma of the pleura were referred to the National Research Institute for Occupational Diseases. In only 1 case was it not possible to elicit a history of significant exposure to asbestos dust. An occupational and environmental history must be taken by a knowledgeable person before it is possible to conclude that there has been no asbestos exposure.

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Lynch and Smith,[1] in 1935, were probably the first to record the association between respiratory neoplasms and exposure to asbestos fibre. They reported an increased incidence of carcinoma of the lung in workers suffering from asbestosis, a relationship which has subsequently received considerable attention. However, the neoplasm of concern in relation to asbestos exposure is clearly mesothelioma of the pleura.

Primary mesothelioma of the pleura or peritoneum is rare, and is found in 0,02 - 0,2% of all autopsy cases in the Western world.[2] This neoplasm has been named a 'specific hazard of heavily exposed asbestos workers',[3] an observation which demands careful study. Yet, much that has been written on the clinical and historical background of cases of mesothelioma is not exhaustive. The reason is that many articles have been written by pathologists who are involved in the difficult diagnostic aspects of the tumour, but who are not responsible for taking patient histories. Too many specimens, certainly in South Africa and probably elsewhere, reach pathologists with the short clinical note: 'No asbestos exposure'. Also, many series have been based on postmortem results, with occupational histories provided in retrospect by family members or fellow workers. Such histories, not taken from the patients themselves, would be unacceptable in other spheres of clinical medicine.

On the other hand, it must be accepted that there are series with a high percentage of mesothelioma cases in which no history of exposure to asbestos can be established (Johannesburg Asbestos Symposium 1977).

The percentage of mesothelioma patients with histories negative for asbestos fibre exposure has been high in certain series — up to 30%. Consequently, and unfortunately, legal opinion in many countries has held that mesothelioma cannot be accepted as an occupational disease, since in so many cases the cause is unknown and presumably not related to asbestos exposure. The need to obtain a clear picture of the association between asbestos exposure and mesothelioma has been stressed by Selikoff *et al.*,[4] who recommend that research leading to 'clarification and resolution of the foregoing statistical uncertainty' be treated as 'a matter of considerable concern'. To underline this concern, two recent articles have reported groups of cases showing extreme contrast: in one series there was 98% exposure,[5] and in another there was no asbestos exposure in 36 cases.[6]

By reporting this predominantly positive series we do not suggest that all cases of mesothelioma everywhere in the world are caused by exposure to asbestos fibre. It is presented to prove that a history of exposure to asbestos can be established in a significant number of cases if histories are taken from the patient and recorded by medical specialists with experience in the field of occupational medicine. By this report it is also hoped to influence the recognition of mesothelioma as an occupational disease in South Africa and in other countries where it is not yet so defined.

HISTORY OF MESOTHELIOMA IN SOUTH AFRICA

In 1957 Wagner *et al.*[7] studied 33 histologically proven cases of mesothelioma at what was at that time the Pneumoconiosis Research Unit in Johannesburg. Past occupation and place of residence were investigated in detail. In all but 1 case they were able to establish a satisfactory history of exposure to asbestos, thus a very significant percentage of association. By 1962 Wagner[8] had diagnosed a total of 87 pleural and 2 peritoneal mesotheliomas, of which 12 occurred in patients with industrial exposure to asbestos and the remainder in patients from the regions of the Cape asbestos fields. In only 2 cases was it not possible to establish a history of exposure to asbestos dust.

In 1973 Webster[9] reviewed 232 cases of pleural mesothelioma, diagnosed as such by the South African Asbestos Tumour Reference Panel comprising leading South African histopathologists. In 9% the occupational history was not known, and 14% were reported as having no history of asbestos exposure. Most of the cases in this series had been investigated with the aid of relatives and fellow workers after postmortem diagnosis.

PATIENTS AND METHODS

The 70 patients reported in this series (Table I) have all been referred to the National Research Institute for Occu-

National Research Institute for Occupational Diseases of the South African Medical Research Council, Johannesburg
J. C. COCHRANE, B.SC., M.D., M.R.C.P.
I. WEBSTER, B.SC. HONS, M.B. B.CH., F.R.C. (PATH.)

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pational Diseases by thoracic surgeons of Johannesburg and the Johannesburg General Hospital. In 69 of the patients there was substantive evidence of asbestos contact; in 1 patient only could no satisfactory history of asbestos fibre contact be obtained. Johannesburg draws a considerable percentage of unusual cases in South Africa, but obviously not all. The Asbestos Tumour Reference Panel, reviewing material from all the provinces, has over the same period (4 years) dealt with a further 154 cases, making a total of 224. The total number of cases of mesothelioma at present entered in the register is 711 (up to October 1977). These have been collected over a period of 25 years.

TABLE I. SOURCE OF CONTACT IN MESOTHELIOMA PATIENTS EXPOSED TO ASBESTOS

Non-occupational environmental — lived on asbestos mines, Northern Cape	13
Environmental and occupational, Cape area — road worker, surfacing with asbestos tailings	1
Asbestos transport workers, drivers and loaders	5
Medical officer on asbestos mine	1
Asbestos mining	
Underground miners	7
Mill (surface) workers	2
Boilermakers lagging surface installations	2
Asbestos-cement industry	
Mixing raw materials	4
Laboratory workers and others in constant contact with quantities of asbestos (including maintenance fitters)	5
Sheet cutting	1
Transport and loading of asbestos outside mining areas	3
Locomotive workshops	
Asbestos insulation of boilers	12
Ship engine room repairs	2
Welders in other workshops using asbestos cloth insulation, gloves and rods	2
Building	
Asbestos blocks, sheet cutting for ceilings and roofs, and sound-proofing with asbestos materials	3
Electrical	
Electricians exposed 1 year or more to high concentrations of fibre in closed areas underground or in ceilings or workshops	3
Boilers — workshops	
Installation, demolition or repair	2
Asbestos textile handling	
Jewellery manufacture	1
Total	69

All patients reported here have been subjected to open thoracotomy biopsy. The biopsy specimens were examined by the staff of the National Research Institute for Occupational Diseases and referred to the South African Asbestos Tumour Reference Panel who confirmed the diagnosis of malignant mesothelioma. Of the cases reported 61 are White and 9 Black. The paucity of Blacks can be explained, as such patients are referred to their regional hospitals and not to the thoracic surgeons in Johannesburg. Also, when the tumour is suspected, many Black workers, faced with a diagnostic exploration, refuse further investigation and return home. Few miners are included in the present series, because it is based on those patients referred to the Institute from the non-mining industry. The few patients recorded under 'Mining' (Table I) had spent only part of their careers in that industry, as miners or in supportive activities, e.g. as electricians. This period had, however, been the significant, although incidentally uncovered, time of their asbestos exposure.

History-Taking

Histories were taken from patients by one or other of the authors, usually by both. Where confirmation of exposure to asbestos fibre was necessary, it was obtained from executive or government sources. All interviews were repeated at least once. This was necessary to give the patient an opportunity to think over the details and environmental aspects of his working career. With 'from exposure-to-tumour' intervals varying from 9 to 40 years in this series, stress had to be laid on the worker's early history, and for many recall was not immediate.

The requirement of an adequate and a significant exposure as applied to this group was a minimum of 4 months of constant exposure to an atmosphere of visible floating asbestos fibres, or 4 years in 'room' contact with loose asbestos fibre not visible in the atmosphere.

For 'environmental' cases a minimum of 3 years' residence was required in a mining area, on mine property (where floating fibre was more or less constantly in the air) or in a town where, for example, the subject had played in the grounds of an asbestos mill or on dumps of asbestos tailings during childhood.

The following are examples of positive histories obtained on requestioning or rethinking:

1. An electrician employed on the gold mines, who was examined and recorded as 'gold mines only — no asbestos contact', recalled that he had for 2½ years cut, drilled and fitted asbestos panels to electric switches in small underground stations. Throughout the period plumbers were working next to him in these confined areas, stripping old asbestos lagging from all piping and replacing it with new.

2. A second electrician on a gold mine, who was recorded as 'no contact', recalled that he had been withdrawn from his normal work for 2 years to make experimental fish-friers for hostels out of asbestos sheeting and with asbestos fibre insulation and lagging. This was done in a small workshop without a protective mask. During his apprenticeship, he occasionally spent time throwing 'snowballs' of asbestos at his fellow workers.

3. A third electrician, who was positive that he had 'never worked with or near asbestos', later recalled that he had worked for 9 months in the roof spaces of a hospital, installing electric wiring while plumbers were putting in pipes with extensive asbestos lagging and insulation and builders were fitting asbestos-cement ceilings. He finished each day 'white with dust'. He had also for 2 years done repairs in ship engine rooms while asbestos lagging was being replaced.