

Exposure to asbestos and laryngeal carcinoma

By P. M. STELL and T. MCGILL*
(Liverpool)

Introduction

MAN has contaminated his environment with a great variety of particulate and gaseous impurities. Many of these are toxic or highly irritating, some are known carcinogens, and others are suspected of having either carcinogenic or co-carcinogenic properties. One of this group of substances is asbestos, which is a generic term used to describe the chain-silicates occurring naturally in fibrous form, and whose chief value is that they have a high melting point and are non-inflammable. They are divided into two mineral groups: (1) pyroxenes—chrysotile (white); (2) amphiboles—crocidolite (blue), amosite (brown), anthrophyllites (white).

Although asbestos was first used in Finland about 2500 B.C. to strengthen clay pots, and in classical times the shrouds of sacred people were woven from asbestos, it can truly be called the twentieth-century mineral. Its output has increased over a thousand-fold in sixty years, compared with a mere fifty-fold for oil, a product often regarded as the symbol of industrial growth.

The modern industry, which began one hundred years ago, embodies the processing and manufacture of asbestos textiles, asbestos cement products and friction material. Asbestos cement is used to protect the steel framework of modern buildings against fire, to form pipes and ducts for water, air and chemicals and to form corrugated roofing. It is also incorporated in brake pads and in heavy duty flooring and is used for thermal insulation of pipes, boilers and machinery and in the superstructure of ships. The principal hazard in these industries is the inhalation of asbestos dust. Furthermore, on account of its widespread use and indestructibility, asbestos is a potential contaminant of the general atmosphere.

Pulmonary asbestosis is an accepted occupational hazard of prolonged exposure to asbestos dust. Lynch and Smith (1935) suggested that patients with pulmonary asbestosis may have an increased risk of developing pulmonary carcinoma. This was confirmed by Doll (1955) who, in a study of the expected mortality in a group of asbestos textile workers, estimated that the risk of pulmonary carcinoma was ten times that of

* T. McGill was awarded the George Seed Prize, 1973, for his contribution to this work.

513

J. Laryngol., Otol., 1975, 89, (5), 513-7

PLAINTIFF'S EXHIBIT

CAP-328

INSTITUTE OF OCCUPATIONAL
AND
ENVIRONMENTAL HEALTH
MONTREAL CANADA

the general population. Wagner, Sleggs and Marchand (1960) described the association between diffuse mesothelial tumours of the pleura and peritoneum and asbestos exposure. Hammond, Selikoff and Churg (1965) have reported a higher incidence of carcinoma of the gastro-intestinal tract in patients with significant exposure to asbestos.

Laryngeal carcinoma has stimulated considerable interest in the search for possible causative agents, especially those of the inhalant type. Cigarette smoking and other forms of tobacco are considered probable aetiological factors in carcinoma of the larynx but a positive causal relationship has not been substantiated statistically.

In view of the fact that the association between asbestosis and pulmonary carcinoma is well established, it was felt worthwhile to explore the possible relationship between asbestos exposure and laryngeal carcinoma.

Materials and Method

One hundred and nineteen patients with a histologically proven squamous carcinoma of the larynx attending the Joint Consultative Clinic of the Liverpool Ear, Nose and Throat Infirmary form the basis material of this study. As a control group, patients were chosen at random from those attending the casualty department of the same hospital with minor complaints, such as wax in the ears, discharging mastoid cavities, etc. All of the patients, and all of the controls were men, and the two groups were matched for age in decades (Table I).

The history of exposure to asbestos and of smoking was then obtained by personal interview in both groups. It was often necessary to ask leading questions about exposure to asbestos, since many of the Liverpool population change their job several times during their working life.

Results

The results show that 27.7 per cent of patients with laryngeal carcinoma had significant exposure to asbestos as compared to only 2.5 per cent of the control series. The difference in the proportion of patients with known exposure in the two series is highly significant: $\chi^2 = 25.0$, $n = 1$ $p < 0.001$.

The age distribution of patients at the onset of their carcinoma and of controls is shown in Table I. From this it can be seen that in patients with laryngeal carcinoma who had a significant exposure to asbestos, the maximum age of onset of their carcinoma is a decade less than in those with no history of exposure.

Three types of occupational exposure were recognized; lagging of heating equipment (twenty patients); scaling of boilers (three patients); and unloading raw asbestos on the docks (ten patients).

Exposure to asbestos and laryngeal carcinoma

TABLE I.
AGE DISTRIBUTION OF PATIENTS AND CONTROLS

	Patients				Total	Controls No.
	History of exposure		No history of exposure			
	No.	%	No.	%		
41-50	4	12.1	10	11.6	14	14
51-60	14	42.4	24	27.9	38	38
61-70	11	33.3	42	48.8	53	53
71-80	4	12.1	9	10.4	13	14
81-90	-	-	1	1.1	1	-
Total	33	-	86	-	-	119

There was no difference in the smoking habits of the patients who were asbestos workers compared to those patients who had no association with asbestos. But, as might be expected, there was a greater percentage of non-smokers among the controls compared with those patients who had laryngeal carcinoma (Table II).

TABLE II.
SMOKING HABITS OF PATIENTS AND CONTROLS

	Patients				No.	Controls %
	History of exposure		No history of exposure			
	No.	%	No.	%		
Non-smokers	4	12.1	6	6.9	25	21.0
1-10 cig./day	8	24.2	18	20.9	23	19.3
11-20 cig./day	12	36.3	30	34.8	40	33.6
Over 20 cig./day	9	27.2	25	29.0	23	19.3
Pipe	—	—	7	8.1	8	6.7

The duration of exposure and the latent period between first exposure and the development of carcinoma are shown on Figure 1.

Discussion

Whilst the results quoted above suggest that there is an association between exposure to asbestos and laryngeal carcinoma, it has to be admitted that this conclusion is based on a retrospective study, with all the disadvantages of such a study. We would also like to point out that this report is based on a small number of male patients who may have been influenced by the prospect of compensation.

In our series of thirty-three cases of laryngeal carcinoma with a history of exposure to asbestos there was only one patient with pulmonary asbestosis. The explanation of this apparent anomaly seems to be that

P. M. Stell and T. McGill

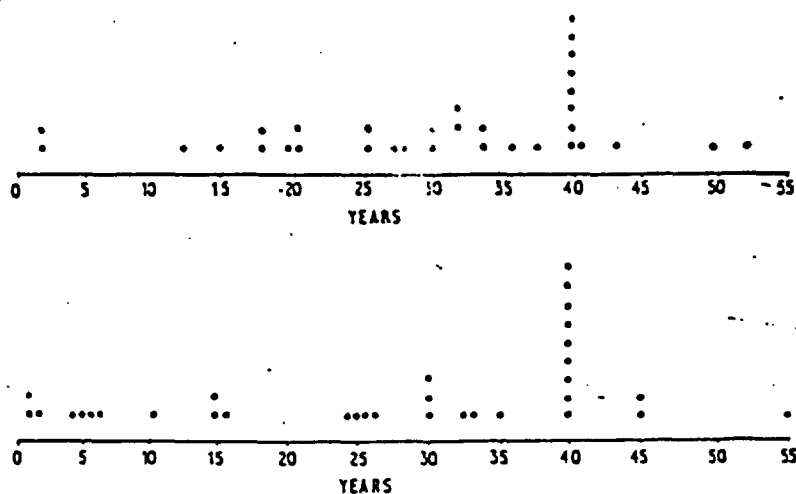


FIG. 1.

heavy industrial exposure in the past has in most cases resulted in severe pulmonary asbestosis and early death before the patient could survive long enough for cancer to develop. With the introduction of modern precautions for the protection of asbestos workers, there has been a fall in the incidence of asbestosis and an increase in the number of cases of asbestos-associated cancer. This would be in keeping with a long latent period, of say thirty years, as in our patients. We also do not know whether the small amounts inhaled as a result of asbestos air pollution have an effect comparable to the much larger amounts inhaled in industry.

It is also of interest that a further patient, not included in this series, died of pleural mesothelioma seven years after a laryngectomy for a squamous carcinoma of the larynx.

The patients' smoking habits were similar, irrespective of their exposure to asbestos. As expected, however, there were more smokers among the patients than among the controls. It may be that smoking is a co-factor in the development of laryngeal carcinoma, due to the absorption of carcinogenic substances onto the asbestos fibre.

At the moment we are examining larynges which have been removed surgically from patients with laryngeal carcinoma who had significant exposure to asbestos, for the presence of asbestos bodies and asbestos fibres. This may give further information on the potential role of asbestos in laryngeal carcinoma.

Summary

One hundred and nineteen male patients with squamous carcinoma of the larynx and 119 matched controls with various non-malignant diseases were questioned about their exposure to asbestos. Thirty-three patients

Exposure to asbestos and laryngeal carcinoma

and three controls had experienced an important degree of exposure to asbestos. The difference between the two groups was statistically highly significant.

REFERENCES

- DOLL, R. (1955) *British Journal of Industrial Medicine*, 12, 31.
HAMMOND, E. C., SELIKOFF, I. J., and CHURG, J. (1965) *Annals of the New York Academy of Sciences*, 132, 519.
LYNCH, K. M., and SMITH, W. A. (1935) *American Journal of Cancer*, 24, 56.
WAGNER, J. C., SLEGGS, C. A., and MARCHAND, P. (1960) *British Journal of Industrial Medicine*, 17, 260.

Department of Otolaryngology,
E.N.T. Infirmary,
Myrtle Street,
Liverpool 7.