the pneumoconioses as a whole. In this same series 8.3 per cent of cases without any pneumoconiosis had cancer of the lung. Merewether and Gloyne's cases were analyzed over a comparable period of time so that it seems unreasonable to interpret the figure of 6.9 per cent as reflecting the increase of lung carcinoma in the general population. The discrepancy in the data probably is explained by the fact that Gloyne's material was selected from the pneumoconioses in which the histories and x-rays were "unusual."

Gloyne noted that 14.1 per cent of patients with asbestosis had lung carcinoma. This figure parallels the observations of previous workers and is significantly above that recorded for silicosis. As has been mentioned the asbestos particle probably acts as a mechanical irritant while the pulmonary changes in silicosis are considered due to the chemical properties of silica.[18,20]

Carcinoma of the lung appears to be prominent in females with asbestosis. Of Merewether's thirty-one cases nine were females, or 29 per cent, and in Gloyne's series of seventeen cases the incidence was 41 per cent. In the published autopsy reports data as to the sex of the patient are available in twenty-three, of which five (21 per cent) were females. In contrast, the incidence of bronchogenic carcinoma in females in the general population is considerably lower. Lindskog noted an incidence of 4.0 per cent,[57] Graham[7] 5.4 per cent, Doll and Hill[8] 8.4 per cent and Ochsner[10] 10.3 per cent. The higher figure in asbestosis supports the theory that asbestos particles act as carcinogens.

Experimental production of neoplasms has demonstrated that chronic irritation of body tissues by mechanical means may predispose to the development of malignancy. Asbestos particles when lodged in the finer bronchioles serve as mechanical irritants to the bronchial epithelium. The squamous metaplasia of the lungs found frequently in asbestosis is presumably a consequence of prolonged irritation in the lower respiratory tract. Some pathologists consider squamous metaplasia as an alteration in the cellular structure that may precede or be the initial step towards the development of squamous cell carcinoma.[58]

A "lag period" between the exposure to a possible carcinogen and the onset of malignancy is characteristic. Nordmann[38] noted in his cases that the average duration between the initial exposure to asbestos and the development of bronchogenic carcinoma was about eighteen years. Similarly Merewether[1] found that patients dying of carcinoma of the lung had a longer mean exposure to asbestos (16.5 years) than those dying with no evidence of malignancy (13.4 years). Finally, a short but "adequate" exposure may be followed by pulmonary malignancy many years later. In Merewether's series is the case of a woman who was an asbestos worker for only six months yet later developed lung carcinoma. Gloyne[35] reported the case of a woman with an exposure of nineteen months who died fifteen years later at the age of seventy-one with a squamous cell carcinoma of the right lower lobe.

Table IV summarizes the pertinent information of the twenty cases of asbestosis with lung carcinoma that have been autopsied and recorded in the available literature. Four cases have been added to the list compiled by Homburger[46] in 1943. It is noted that in about four-fifths of the cases in which the primary site is indicated the origin of the neoplasms was in the lower lobes. This is in contrast to the general population where bronchogenic carcinoma seems to be more frequent in the upper lobes. In Lindskog's[59] series there was an incidence of 57 per cent in the upper lobes, 26 per cent in the lower lobes. Ochsner[10] found 56 per cent in the upper lobes and 35 per cent in the lower lobes. No conclusions should be drawn from the small number of cases listed in Table IV. Nevertheless, since asbestos particles lodge to a greater extent in the lower respiratory tree where the changes of asbestosis are also more pronounced, a higher incidence of carcinoma in this location should be expected if an etiologic relationship exists. In our case the asbestosis was widespread and severe, and the tumor, which originated in the inferior (lingual) segment of the left upper lobe, was in an area significantly involved by the fibrosis and inflammation of asbestosis.

It is also noted in Table IV that twelve of the nineteen previously recorded cases had lesions of the squamous cell type. The incidence of squamous cell carcinoma is said to be high in male cigarette smokers with pulmonary malignancy.[6] At autopsy our patient showed both squamous metaplasia and adenocarcinoma of the lingula. It may be of significance that he was a chain smoker for over twenty years in view of the observation by Wynder and Graham[7] that males with adenocarcinoma of the lung are