Asbestos bodies in lungs at necropsy

G. HEFIN ROBERTS

From the Southern General Hospital, Glasgow

SYNOPSIS This study was made in Glasgow, Scotland, near an industrial area where ship building is an important industry. Asbestos bodies were found in 23% of 100 consecutive hospital necropsies, bodies were present in 37% of the 62 males, none were found in 38 females. These findings are compared with results of other similar surveys. In 85.4% of cases showing asbestos bodies, hyaline pleural plaques were found. There was one case of asbestosis and three of bronchial carcinoma in the cases showing asbestos bodies.

Asbestos-containing products are today used widely in industry and homes. The relatively few necropsy studies of the prevalence of asbestos bodies in the lungs of urban dwellers have shown that they are found with surprising frequency, and the present investigation was designed to find the incidence of asbestos bodies in lungs from a consecutive series of hospital necropsies in Glasgow.

MATERIALS AND METHODS

The material was obtained from a series of 100 consecutive adult necropsies performed in a hospital which serves a large urban population of south-west Glasgow, close to the Clyde with its concentration of heavy industry.

At necropsy, thick smears were made on 3 x 1 in. (75 x 25mm.) microscope slides from the cut surfaces of the basal segments of both lower lobes. The smears, consisting mainly of red blood cells, were air dried, dehydrated in spirit and alcohol, cleared in xylol and mounted in D.P.X. Three hundred consecutive low-power fields (16mm. objective) were examined from each slide, and the presence of asbestos bodies was confirmed by the 4mm. objective. Only typical asbestos bodies were accepted for counting (Fig. 1); 'pseudoasbestos' bodies having a black carbonaceous centre, surrounded by a variable amount of yellow coating, were disregarded (Fig. 2). Fragmented asbestos bodies were not accepted for counting; complete bodies could also be found in these cases.

In 81 cases the pleural cavities and diaphragm were examined for hyaline and calcified pleural plaques.

In none of these cases was a detailed occupational history available but a note was made of the patient's present occupation, when available, in the clinical notes. Most of the women were described as 'housewives'; some of the elderly men simply as 'retired' or 'pensioner'; in the remainder there was a wide variety of occupations, most were skilled tradesmen.

Received for publication 28 February 1967.

RESULTS

AGE AND SEX DISTRIBUTION In the 100 cases there were 62 males and 38 females; the mean age at death was 65 years (range 24 to 85 years). As in any consecutive necropsy series, the middle-aged and elderly

FIG. 1. Segmented asbestos body. Basal lung smear (unstained x 11,000).
of the
in
ASBESTOS
BODIES Asbestos
lung
smear
2.
FIG.
of the whole
seventh
decades.

41-50
Male
(yr.)
38
females.

11

61-70
51-60
71-80
81-90
Total

In
100
cases (23%).
The bodies were all found in
the 62 males (37.0%), and none were found in
the 38 females. Table I gives the age and sex
distribution of the whole series and those cases
showing asbestos bodies.

TABLE I
AGE AND SEX DISTRIBUTION OF 100
NECROPSY CASES AND THE 23 CASES
SHOWING ASBESTOS BODIES

<table>
<thead>
<tr>
<th>Age Groups (yr.)</th>
<th>Number of Cases</th>
<th>Asbestos Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>21-30</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>31-40</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>41-50</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>51-60</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>61-70</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>71-80</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>81-90</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>38</td>
</tr>
</tbody>
</table>

In 11 cases the asbestos bodies were found in the
seventh decade, in which age group 50% of the
male cases showed asbestos bodies. The youngest
case in which asbestos bodies were found was a man
of 46 years, described as a joiner in a shipyard; the
oldest was an 84-year-old man said to be a 'retired
engineer'.

NUMBER OF ASBESTOS BODIES IN SMEARS. Although
basal smears are believed to show the highest
concentration of asbestos bodies, too much
significance cannot be attached to the number of bodies seen
in each case. The smears represent only a small random
sample of the basal segments and give no indication
as to the concentration of asbestos bodies in the
whole lung. Table II gives the distribution of bodies
found in the 23 positive cases.

<table>
<thead>
<tr>
<th>Number of Bodies in 600 Low-power Fields</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>11</td>
</tr>
<tr>
<td>5-10</td>
<td>2</td>
</tr>
<tr>
<td>11-20</td>
<td>4</td>
</tr>
<tr>
<td>21-30</td>
<td>0</td>
</tr>
<tr>
<td>31-40</td>
<td>0</td>
</tr>
<tr>
<td>41-50</td>
<td>1</td>
</tr>
<tr>
<td>51-60</td>
<td>1</td>
</tr>
<tr>
<td>61-70</td>
<td>0</td>
</tr>
<tr>
<td>71-80</td>
<td>1</td>
</tr>
<tr>
<td>81-90</td>
<td>0</td>
</tr>
<tr>
<td>91-100</td>
<td>0</td>
</tr>
<tr>
<td>101-110</td>
<td>0</td>
</tr>
<tr>
<td>111-120</td>
<td>1</td>
</tr>
<tr>
<td>+350</td>
<td>1</td>
</tr>
<tr>
<td>+400</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
</tr>
</tbody>
</table>

In 11 of the asbestos positive cases less than five
asbestos bodies were seen in a total of 600 low-power
fields. The maximum number of 430 bodies was
counted in a man of 74 who died of a cerebral tumour
and whose occupation was recorded in a riveter. Three-
hundred and fifty-seven bodies were seen in a 57-
year-old man, of unknown occupation, who died of
a carcinoma of pancreas.

HYALINE PLEURAL PLAQUES Hyaline or calcified
parietal pleural plaques were looked for in 81 cases;
they were present in 13 (16.0%) and found only in
males. In 11 of these cases (8.5%) asbestos bodies were
identified in the smears. In two cases, widespread
bilaterial calcified pleural plaques were found
with no asbestos bodies in the smears; both these
lungs were grossly oedematous and it may be that
the concentration of the bodies depends to some
extent on the degree of pulmonary congestion and
oedema at the time of death. There were no cases
of pleural or peritoneal mesotheliomata in the present
series.

OCCUPATION The occupation was recorded in 18
Case 572
77
of the 23 positive cases, but further information as
to the detailed nature of the work was not available.
Among the occupations given were: dockworkers,
acters, joiners, turner, plater, coppersmith, brick-
layers, labourer, railway porter, 'retired engineer',
'coaster worker', youth trainer, and riveter.

In this short series there was no obvious correla-
tion between occupation and the number of asbestos
bodies found in the smears.

CASE OF DEATH In the 23 asbestos-body-positive
cases, 12 (52.1%) died of malignant disease. There
were three cases of bronchial carcinoma as detailed
in Table III.

Case 38 may be considered to be the only example
of 'asbestosis' in this series. Although the right lower
lobe scarring in case 4 is also possibly due to asbest-
osis no asbestos bodies were seen in the scar. There
was also a history of widespread pulmonary tubercu-
losis of the right lung some years before death
which could explain the pulmonary scarring.

The remaining nine cases of malignant disease
included stomach (three cases), kidney (two cases),
pancreas (two cases), acute leukaemia (one case),
and one case of a cerebral tumour.

DISCUSSION

The prevalence of asbestos bodies in lungs from
routine hospital necropsies in difference parts of the
world has recently been the subject of several reports
(Table IV).

In addition, Hourihane and his colleagues state
that in their material in London, asbestos bodies
were found in 20-30% of necropsies (Hourihane,
Lesso, and Richardson, 1966). These findings have
led to the concept of urban contamination by asbes-


and 100 consecutive adult necropsies (23%).
All were found in the 62 males (37.0%). The results,
while confirming the high incidence of asbestos
bodies in hospital necropsies, differ from other
reports in that no asbestos bodies were found in the
38 females. Although this series is small, it is com-
parable in size to the series reported by Cauna from
Pittsburgh (Cauna, Totten, and Gross, 1965) in
which asbestos bodies were found in 34% of 47
females. The findings in the present series suggest
occupational exposure of the male, since if urban
contamination were a factor it would be reasonable
to assume that some asbestos bodies would have
been found in females. It will be interesting to see
whether these findings in females can be confirmed in
larger series from other urban communities in Britain.

In this series, of the 23 cases showing asbestos
bodies, 11 were in the seventh decade, in which age
group 50% of the male cases showed asbestos
bodies. Similarly Elmes and his colleagues (1965)
working in Belfast, found that 27% of males in the
seventh decade showed asbestos bodies as compared
to 14% in the sixth decade. The authors suggested
that the difference in the two groups was related

TABLE III

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age</th>
<th>Occupation</th>
<th>No. of Bodies per 600 Fields</th>
<th>Site of Carcinoma</th>
<th>Histology</th>
<th>Bodies in Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>66</td>
<td>Dock labourer</td>
<td>4</td>
<td>Subpleural scar, apex right lower lobe</td>
<td>Adenocarcinoma -</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>66</td>
<td>'Radar worker'</td>
<td>46</td>
<td>Subpleural scar, base left lower lobe</td>
<td>Adenocarcinoma +</td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>66</td>
<td>Fitter</td>
<td>1</td>
<td>Hilar and right upper lobe</td>
<td>Undifferentiated -</td>
<td></td>
</tr>
</tbody>
</table>

TABLE IV

<table>
<thead>
<tr>
<th>Author</th>
<th>City</th>
<th>Number of Cases</th>
<th>Asbestos Bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>M</td>
</tr>
<tr>
<td>Thomson et al. (1963)</td>
<td>Cape Town</td>
<td>500</td>
<td>336</td>
</tr>
<tr>
<td>Cauna et al. (1965)</td>
<td>Pittsburgh</td>
<td>100</td>
<td>53</td>
</tr>
<tr>
<td>Thomson et al. (1966)</td>
<td>Miami</td>
<td>500</td>
<td>304</td>
</tr>
<tr>
<td>Present series</td>
<td>Glasgow</td>
<td>100</td>
<td>62</td>
</tr>
</tbody>
</table>
Asbestos bodies in lungs at necropsy

573

to the fact that the dangers of asbestos had been appreciated before the younger man started work. In Cape Town, there was a rise in the frequency of asbestos bodies in both sexes with age, to 30% in the over-65-years old (Thomson, Kaschula, and MacDonald, 1963). However, in Miami the highest incidence of asbestos bodies in males occurred in the 45-54-year age group (Thomson and Graves 1966); in Pittsburgh the highest relative incidence of positive cases was found between 25 and 34 years (Cauna et al., 1965). It appears that there are differences in the age and sex distribution of asbestos bodies from city to city. It may be that these differences are related to varying degrees of atmospheric contamination.

This series confirms the association between hyaline pleural plaques and the presence of asbestos bodies in the lungs (Hourihane et al., 1966). Parietal pleural plaques with or without calcification were found in 13 of 81 cases (16.0%); in 11 of these (85.4%) asbestos bodies were found in the basal smears. Hourihane and his colleagues stress the value of radiological surveys for calcified pleural plaques as an index to asbestos exposure. They can be equally valuable in necropsy studies as a pointer towards a closer examination of the lungs for scarring due to minimal asbestosis.

The present series is too small for any valid conclusions to be drawn as to the incidence of malignant disease in those showing asbestos bodies compared with those showing none.

Thanks are due to my colleagues Dr. A. Dick and Dr. Mary P. McEwan for collecting some of the smears; also to Mr. George Headden, F.I.M.T., for the photomicrographs.

REFERENCES