Natural History of Coal-Workers' Pneumoconiosis in Men over 65

MARION HILDICK-SMITH, MD, FRCP

Department of Geriatric Medicine, Nunnery Fields Hospital, Canterbury

In Britain in 1975 there were more than 32,000 miners and ex-miners alive and receiving disability pensions for coal-workers' pneumoconiosis, of whom more than half (17,900) were aged 65 or more[1]. This suggests either that the number of new cases of pneumoconiosis has decreased over the years or that expectation of life is not markedly affected by pneumoconiosis, or some combination of both[2].

The number of new cases certified annually has dropped from about 5,000 in 1950 to about 600 in 1975-77; the prevalence has also dropped from 13.4 per cent in 1959-60 to 8.4 per cent in 1974-75. The average age at which men reach the more advanced stages of the disease has been rising steadily, largely reflecting the higher dust levels of earlier years[3]. Of the newly-diagnosed cases in 1975 and 1976, 36 per cent were aged 65 or over. (These were not truly ‘new’ cases but ones that had previously slipped through the diagnostic net.)

There is substantial evidence that expectation of life is not affected by simple pneumoconiosis. Cochrane[4], in a 20-year follow-up of 6,057 Welsh miners, found that those with simple pneumoconiosis and those with ‘A’ shadows had a normal expectation of life. Those with the more extensive ‘B’ and ‘C’ shadows of progressive massive fibrosis had decreased survival rates. Similar results have been shown in American studies[5].

Thus, if the number of new cases is falling, and if the condition does not markedly affect life expectancy, it seems likely that coal-workers' pneumoconiosis will increasingly become a disease of elderly and retired miners. Hence the characteristics of a survivor group of miners who have lived into retirement are of interest and have been studied over a two-year period.

Methods

Between 1975 and 1977, 107 coalminers in Kent who had coal-workers’ pneumoconiosis (CWP) and were aged 65 or more were examined in the course of their normal review by the Pneumoconiosis Panel. The group included those who had left coalmining early, but excluded a few men whose assessments had been ‘finalised’ because of a stroke or other severe disability. The 107 men thus represented substantially all of those with CWP in Kent who had survived into retirement.

The number of years since CWP was first certified was noted, together with the number of years worked underground. The category of CWP at first diagnosis was compared with the classification of the X-ray taken during the survey examinations; similarly, the percentage disability awarded at the onset and at the current examination were compared. The men were asked about their past and present smoking habits and were divided into four groups: present cigarette smokers (S), present pipe smokers (F), ex-smokers (ES), and those who had never smoked regularly (NS).

Spirometry tests were performed in a sitting position using the Vitalograph machine. The technique was first explained and demonstrated; then a practice attempt was made, followed by three recorded attempts. The mean FEV₁ and FVC (forced expiratory volume in one second and forced vital capacity) were calculated and compared with normal values for elderly men. It was difficult to find satisfactory normal values for comparison. Some widely-quoted series contained only a few elderly—for example, Kory et al. had only five men aged 65 and over in their study of 468 men[6]. Other workers have pointed out the high percentage of elderly men who have respiratory symptoms or have been life-long smokers[7, 8]. Variations in the men’s height in different regions led to some difficulties in interpretation. The most reliable studies were those of Milne and Williamson[8] and of Caird and Akhtar[7], both of which used random samples of elderly men living at home (215 and 83 men respectively). Their results were in keeping with those of Flint and Kahn[9] whose study included 103 men aged over 60 who were tested using the Wright’s peak-flow meter. Similar results can be obtained using the formula quoted by Cotes[10], who suggested that the decline in FEV₁ was approximately 0.03 litres per year of increasing age.

Results

The ages of the miners in the review group (Table 1) varied from 65 to 83 years, the average being 70 years. The number of years spent underground in the coalmines (Table 2) varied from 13 to 53 years, the average being 43 years.

The length of time that CWP had been certified varied from a few months to 31 years (Table 3). The majority had been certified for 15-29 years, and the average number of years since certification was 21.

Some 49 miners (46 per cent) were classified on X-ray appearances as having simple pneumoconiosis, that is
Table 1. Ages of miners.

| Age       | No. |
|-----------|-----|
| 65-69     | 52  |
| 70-74     | 35  |
| 75-79     | 17  |
| 80-84     | 3   |
| Total     | 107 |

Average age = 70 years

Table 2. Years underground in coalmining.

| No. of years | No. of men |
|--------------|------------|
| < 25         | 4          |
| 25-29        | 6          |
| 30-34        | 3          |
| 35-39        | 11         |
| 40-44        | 20         |
| 45-49 .      | 37         |
| ≥ 50         | 26         |
| Total        | 107        |

Average no. of years in coalmining = 43

Table 3. Years since CWP certified.

| No. of years | No. of men |
|--------------|------------|
| 0-4          | 5          |
| 5-9          | 1          |
| 10-14        | 6          |
| 15-19        | 28         |
| 20-24        | 30         |
| 25-29        | 33         |
| 30-34        | 4          |
| Total        | 107        |

Average years diagnosed = 21

categories 1, 2 and 3 of the International Labour Office classification[11]. Another 33 men (31 per cent) had an ‘A’ shadow (defined as not exceeding 5 cm in diameter). Of these shadows a small number had the appearance of old tuberculous scars or of rheumatoid (Caplan) pneumo-
coniosis rather than progressive massive fibrosis (PMF) of the usual type. The remaining 25 men (23 per cent) had the more extensive ‘B’ (up to one-third of one lung) or ‘C’ (greater than one-third of a lung) shadowing of PMF (Table 4).

Table 4. Category of CWP in 107 retired miners.

| Category | Number | % |
|----------|--------|---|
| Simple   | 49     | 46|
| ‘A’ shadows | 33     | 31|
| ‘B’ shadows | 23     | 21 |
| ‘C’ shadows | 2      | 2  |

Average age 70 years

Excluding two patients newly diagnosed in 1977, for whom a previous comparison could not be made, only 34 of 105 patients (32 per cent) had moved into a more advanced category (usually the next one in severity) since their first diagnosis. However, 62 of the 105 (59 per cent) had had their assessment of disability increased by a Medical Board during this period, often for accompanying disorders such as chronic airflow obstruction (14 patients) or tuberculosis (5 patients). Over a period of 22 years the average increase in assessment was 20 per cent.

Spirometry tests were performed by all but 12 patients. Those excluded had severe angina (4) or active tubercu-
losis (1) or were mentally incapable or unwilling to perform the test as instructed (5). One man was too dyspnœic to try the test, and in one the attempt repeatedly produced severe coughing.

Of the 95 men tested (Table 5) 72 (76 per cent) had normal FEV1 and FVC, using the norms of Milne and Williamson[8] and Caird and Akhtar[7]. When the proportion of FEV1 to FVC was 70 per cent or more, it was assumed that there was no airflow obstruction. This was the case in 32 men (34 per cent of those tested); 11 smoked cigarettes, 6 smoked a pipe, 11 were ex-smokers and 4 non-smokers. The average disability of the 32 men at onset was 10-15 per cent, but three men had been originally over-assessed at 30 per cent or more. In 17 of these 32 men the assessment of disability was raised during the subsequent 20 years, and in 12 cases this rise was of 20 per cent or more. The rise was justified in most of the 17 men by the appearance of further ‘A’ or ‘B’ shadows; but was not justified in six by either X-ray changes or spirometry results.

Forty-one miners who showed an intermediate FEV1:FVC ratio of 56-69 per cent highlighted an interesting problem. There was a discrepancy here between the two norms used. Milne and Williamson[8] accepted 54.5 per cent and over as normal for men aged 62-69, and 50.4 per cent and over as normal for men aged over 70. Caird and Akhtar[7] accepted only values above 64.9 per cent for the 65-74 age-group. It seemed more likely that the Milne and Williamson ‘norms’ matched better with the normal values quoted for FEV1 and FVC separately, and, using their figures, 37 of 41 men showed fully normal results. The current X-ray category in this intermediate group varied from ‘B’ (8 men) to minimal pneumo-
coniosis (cat. 0/1 to 1/1) in eight men.

Of the 22 men whose FEV1:FVC ratio was 55 per cent or less, nine had ‘chronic bronchitis’ or ‘obstructive airways disease’ incorporated into their assessments, and only one of these 22 men was a non-smoker. The current X-ray category varied widely from ‘B’ or ‘C’ shadowing
(in 7 men) to minimal pneumoconiosis, category 0/1 (in 4 men).

There was no clear correlation between X-ray category and spirometry results (Table 6), as other workers have

Table 6. Percentage of abnormal spirometry results in miners with different categories of CWP.

| Category | No. | % |
|----------|-----|---|
| 0/1—1/1 | (6 of 16) | 38 |
| 2        | (3 of 24) | 13 |
| A        | (6 of 32) | 19 |
| B        | (6 of 21) | 29 |
| C        | (2 of 2)  | 100|
| Total    | (23 of 95) | 26 |

also found[12]. The unexpectedly high percentage of abnormal results in category 0/1-1/1 patients occurred because four of the six abnormal patients had FEV1:FVC ratios of less than 55 per cent and evidence of chronic airflow obstruction. Smoking was another complicating factor, since 52 of the 107 miners were current cigarette-smokers, 33 had smoked cigarettes in the past, 10 were pipe-smokers and only 12 were non-smokers.

Discussion

In a condition in which compensation is involved, subjective symptoms alone can be unreliable. This study therefore concentrated on objective evidence such as X-ray appearances and repeated spirometry tests.

The study was done on a 'survivor' group, i.e. miners and ex-miners who had survived into retirement. (Rooke[13] suggests that 72 per cent of miners die aged 64 or more, which emphasises that this is now an important survivor group.) Some miners will have died earlier from accidents, other illnesses, respiratory diseases such as CWP, or obstructive airways disease, and no conclusions can be drawn about this group, which was outside the study.

Only miners living in Kent were examined, and there is danger in applying results from one geographical area to another, because of the differences in male mortality rates[14], respiratory function tests and so on. However, Kent is a relatively new coalfield, and in the 1930s it accepted miners from coalfields in South Wales[15], Northumberland, Durham and Yorkshire. Thus the retired Kent miners represent a mixed stock with an experience of dust exposure from different coalmines. The results of this study may therefore be applicable, with caution, to retired coalminers in other parts of Britain, as no previous study of this sort has been done.

In this survivor group, CWP was less severe than expected. Many of the men had survived with the condition into their seventies, and a few into their eighties[14, 16]. The average age of the whole group (70 years) was the same as the average age of the 25 men who had the most extensive 'B' and 'C' shadows. Judged by X-ray category, only one in three had shown progress in CWP over a period of 15 to 20 years. Although CWP had been diagnosed, on average, for 21 years, it did not seem to have cut short the men's working lives, as the average time spent underground in mining in this group was 43 years.

With hindsight it appears that a proportion of patients were originally over-assessed, both from the point of view of disability and of X-ray category; 17 of the 107 would now be categorised as 0/1-1/1, i.e. showing insufficient dust for a diagnosis of CWP as currently accepted by the Pneumoconiosis Medical Panels. In the USA, where assessment is more lenient, 88 per cent of those approved for benefits were not disabled[17]. In a survey of 99 patients from 14 general practices in Britain[18], no significant relationship was identified between disability and pneumoconiosis pension (though the claim that over half the men had no spirometry performed by a Pneumoconiosis panel is hard to credit). Some 84 per cent of the patients in that survey had simple pneumoconiosis, so the group was biased towards low disability. This was not true of the present study, as only 46 per cent had simple CWP. In 1975 in Britain some 43 per cent of those miners who had CWP had their disability assessed at 10 per cent or less[1]. In the group we studied some 27 per cent were assessed at this level, again suggesting no bias towards low disability.

The finding that 76 per cent of the men tested had normal spirometry for their age may be surprising. It has also been shown how difficult it is to disentangle the effects of chronic obstructive airways disease and of smoking from the effects of CWP. The average miner finds it difficult to accept that part of his disability may stem from these other causes, and this conflict of views may be the cause of bitterness[19].

Expert opinion is divided[19] about whether simple CWP causes any disability in excess of that attributable to the combined effects of the level of dust exposure[20], smoking habits, age and physique. Opinion is even more divided on the role of dust in industrial bronchitis’, and little firm evidence[21, 22] is available. Gilson[23] found no increase in bronchitis and no worsening of lung function tests as the CWP category increased. His views were supported by some[5, 24, 25] and contradicted by others[21, 26, 27]. Several large studies[24, 25] point out that the effect of smoking is about five times as significant as that of dust in producing ‘bronchitis’. Disentangling the relative effects of dust and cigarette-smoking is difficult epidemiologically, and was thought to be impossible in an individual exposed to both[28]. However, dust-induced hypersecretion of mucus has now been shown to be transient[29], and dust exposure by itself does not cause airflow obstruction in bronchitis.

A further difficulty lies in separating the medical from the socio-economic factors (housing, atmospheric pollution, less adequate medical facilities) that lead to miners' wives also having an excess mortality from bronchitis[23]. The changing situation is illustrated by the fact that later reports show a normal life expectancy for miners[30].

The careful physician will not be unduly influenced in his clinical assessment of the elderly miner with coincidental pneumoconiosis by his reported percentage of disability or his X-ray category of pneumoconiosis. The
disability percentage may be a legacy of an earlier over-
assessment (which cannot be rescinded) and should be
checked against the patient’s current performance in
spirometry tests. Similarly, an X-ray category may need
reviewing—and if ‘A’, ‘B’ or ‘C’ shadows are present,
the lesions they represent may cause as little disturbance
of lung function and anatomy as similarly-placed space-
occupying lesions of other pathology.

Simple CWP is symptomless[31, 32]. It does not give
rise to cough, sputum, wheeze or chest pain, and it is
important, and in the miners’ interest, that the physician
should look for other, potentially reversible, causes of
these symptoms, including cigarette-smoking.

‘New’ cases of pneumoconiosis can be revealed in
retirement, by which time the miner may be living in an
area remote from his previous work. If an X-ray shows
unexpected widespread opacities, it is important to ask
questions about industrial exposure to dusts and to seek
old films. If the physician thinks of the possibility of
CWP, he may save the patient much unnecessary investi-
gation and anxiety.

The findings in this group of miners who have survived
to retirement suggest that many cases of CWP have a
more benign course than was thought possible 30 years
ago. With continued control of respirable dust under-
ground, the risk of disablement by CWP is appreciably
less than it was a decade ago[33], and there is hope that
CWP will become increasingly uncommon in Britain.

Summary

Between 1975 and 1977, 107 Kent miners aged 65 or over
who had coal-workers’ pneumoconiosis (CWP) were ex-
amined for current disability. The men had worked an
average of 43 years underground. Forty-nine had simple
CWP, and 48 complicated (33 ‘A’, 25 ‘B’ and ‘C’
shadows). In only 34 had their CWP category increased
during the last 21 years, though 62 had had their disability percentage increased (by an average of 20 per
cent).

Seventy-two of the 95 men tested by spirometry showed
normal results for their ages. No clear relationship existed
between spirometry results and category of CWP. The
complicating effects of obstructive airways disease or
cigarette-smoking were difficult to disentangle from those
of CWP.

Coal-workers’ pneumoconiosis is increasingly a disease
of elderly miners, and can be more benign than was
previously thought. It is in these miners’ interests that
other (perhaps treatable) causes should be sought for any
chest symptoms.

Acknowledgements

The author acknowledges with grateful thanks the helpful
criticism of this paper by Dr W. Raymond Parkes,
FRCP. The clinical examinations were done when the
author was a part-time member of the London Pneumo-
coniosis Panel; the availability of past records was an
important factor in making the study possible.

References

1. Department of Energy (1977) Digest of Pneumoconiosis Statistics 1975,
   Table 7. London: HMSO.
2. McLintoch, J. S. (1976) Proceedings of the Royal Society of Medicine, 69,
   9.
3. National Coal Board (1981) Medical Service Annual Report, 1979-80.
   London: National Coal Board.
4. Cochrane, A. L. (1973) British Medical Journal, 2, 532.
5. Leroy Lapp, N., Morgan, W. K. C., Ortmeier, C. E. and Rege,
   R. (1974) Lancet, 1, 351.
6. Kory, R. C., Callahan, R., Boren, H. G. and Syner, J. C. (1961)
   American Journal of Medicine, 30, 243.
7. Caird, F. I. and Akhtar, A. J. (1972) Thorax, 27, 764.
8. Milne, J. S. and Williamson, J. (1972) Clinical Science, 42, 371.
9. Fie, F. J. and Khan, M. O. (1962) British Medical Journal, 2, 1231.
10. Cotes, J. E. (1975) Lung function: Assessment and Application in
    Medicine. Oxford: Blackwell.
11. International Labour Office (1980) Guidelines for the use of ILO
    International Classification of Radiographs of Pneumoconioses. Occupa-
    tional Safety and Health Series No. 22. (Rev. 80). Geneva: ILO.
12. Cochrane, A. L. and Higgins, I. T. T. (1961) British Journal of
    Preventive and Social Medicine, 15, 1.
13. Roke, G. B., Dempsey, A. N. and Ward, F. G. (1976) British
    Medical Journal, 2, 1194.
14. Cochrane, A. L. (1976) Proceedings of the Royal Society of Medicine, 69,
    12.
15. Hicks, D., Fay, J. W. J., Ashford, J. R. and Rae, S. (1961) The relation
    between pneumoconiosis and environmental conditions. London: National
    Coal Board.
16. Parkes, W. R., Phillips, T. and Williamson, R. G. B. (1976) British
    Medical Journal, 2, 1319.
17. Dunea, G. (1981) ibid., 282, 1773.
18. Ross, A. K. (1981) ibid., 283, 64.
19. Muir, D. C. F. (1976) Proceedings of the Royal Society of Medicine, 69,
    10.
20. Jacobsen, M., Burns, J. and Atfield, M. D. (1977) In Inhaled
    Particles IV, pp. 759-772. (ed W. H. Walton.) Oxford: Pergamon.
21. Rogan, J. M., Atfield, M. D., Jacobsen, M., Rae, S., Walker, D.
    D. and Walton, W. H. (1973) British Journal of Industrial Medicine, 30,
    217.
22. Guidotti, T. L. (1979) Southern Medical Journal, 72, 456.
23. Gibson, J. C. (1970) Proceedings of the Royal Society of Medicine, 63,
    857.
24. Kibeltis, J. A., Morgan, E. J., Rege, R., Lapp, N. L., Seaton, A.
    and Morgan, W. K. C. (1973) American Review of Respiratory
    Disease, 108, 886.
25. Hankinson, J. L., Rege, R., Fairman, R. P., Lapp, N. L. and Morgan,
    W. K. C. (1977) In Inhaled Particles IV, pp. 737-755. (ed W. H. Walton.)
    Oxford: Pergamon.
26. Lyons, J. P. and Campbell, H. (1976) Thorax, 31, 527.
27. Ryder, R., Lyons, J. P., Campbell, H. and Gough, J. (1970)
    British Medical Journal, 2, 481.
28. British Medical Journal (1981) 283, 457.
29. Fletcher, C. and Peto, R. (1977) ibid., 1, 1645.
30. Rockette, H. E. (1977) Journal of Occupational Medicine (Chicago), 19,
    795.
31. Parkes, W. R. (1982) Occupational Lung Disorders. London: Butten-
    worth.
32. Morgan, W. K. C. and Seaton, A. (1975) Occupational Lung Diseases.
    Philadelphia: Saunders.
33. Seaton, A. (1982) British Medical Journal, 284, 1507.