Cigarette Smoke as a Cause of Small Irregular Opacities on Chest Radiographs
A. L. FRANK1*, R. BEATY2 and J. LEVIN1

1The University of Texas Health Center at Tyler, 11937 US Highway 271, Tyler, TX 75708; 2American Airlines, DFW Area Medical Director, PO Box 619047, MD1135, DFW Airport, TX 75261-9047, USA

Asbestos, as well as other dusts and a variety of medical conditions, can cause irregular opacities to develop in the lung parenchyma. Although not widely accepted, some have suggested that cigarette smoke can produce these changes as well. This study looked at X-rays of individuals for whom smoking status was known, as well as an occupational history which precluded known dust exposure. There was no finding that smoking status contributed to the development of irregular opacities. As previously described, smoking does appear to increase the level of profusion caused by asbestos.

Keywords: asbestos; irregular opacities; lung fibrosis; smoking

INTRODUCTION

The International Labour Organization (ILO) classification of radiographs for changes associated with pneumoconiosis-producing dusts has been utilized for many years, and there continues to be controversy regarding other factors that can change the appearance of chest radiographs. There is now considerable evidence that the profusion of irregular opacities can be increased by cigarette smoking. Numerous reports document this interrelationship (Lilis et al., 1986; Hnizdo and Sluis-Cremer, 1988; Rosenstock et al., 1988; Delclos et al., 1990; Welch et al., 1994). A few individuals have claimed that cigarette smoking alone can lead to the development of irregular opacities, although few papers on this subject document this finding (Weiss, 1984, 1988). This study was undertaken to evaluate once again the ability, if any, for cigarette smoke to produce irregular opacities that might look as if they were caused by exposure to a pneumoconiosis-producing dust.

MATERIALS AND METHODS

The study population came from the Tyler Asbestos Workers Program (TAWP). This group, first established in 1974 as a medical surveillance program for a group of former amosite-exposed workers, has been reported upon previously with regard to other aspects of their health experience (Hurst et al., 1979; Levin et al., 1998). This cohort is a successor cohort of a similar group of workers first studied by Selikoff in Patterson, NJ (Selikoff et al., 1972), the Tyler group resulting from moving equipment and process to a facility in Tyler, TX. The health experience of these two groups has been remarkably similar (Levin et al., 1998).

As the TAWP group was studied, a control group of individuals non-occupationally exposed to asbestos was created to serve as a control for various aspects of the surveillance program, such as comparison of cytopathology findings. This control group were all males, all came from the Tyler area, all had chest radiographs done, their smoking and occupational exposure history recorded, and pulmonary function tested.

Smoking status was obtained by a questionnaire, which also documented occupational history. There was a recording of the number of years smoked, how many cigarettes were consumed daily and status (smoker, ex-smoker or non-smoker). An ex-smoker was defined as someone who had stopped smoking for at least six months prior to responding to the questionnaire.

Three experienced readers of radiographs for pneumoconiosis-related changes read the films independently. The films consisted of an inspiratory posteroanterior (PA), left lateral, and expiratory posteroanterior. Since each subject had a series of chest radiographs, the most recent film was used for this study. A 10% ‘seeding’ of known positive films was included, and each film was classified according
to the ILO 1980 system, but was evaluated for type and profusion of parenchymal changes only. A median reading of the three scores was calculated, and only those with a profusion category of 1/0 or higher for parenchymal abnormalities were considered positive. For the control group, 161 radiographs of the initial group of 178 could be located and read.

The statistical analysis was carried out with prevalence calculated using descriptive statistics of independent (age, smoking) and dependent (profusion) variables. Fischer’s exact test was used to measure the association between smoking and profusion. Logistic regression was performed to examine the relationship between the amount smoked (pack-years) and profusion, and age and profusion, for the median readings and for each individual reader. The precision of the measurement of profusion was evaluated by measuring interreader variability using the kappa statistic.

RESULTS

Of the 161 non-asbestos-exposed individuals, 56 (34.8%) were never smokers, 38 (23.6%) were ex-smokers, and 67 (41.6%) were smokers when their X-rays were taken. The mean pack-years for the smokers and ex-smokers was 29.7 ± 21.0.

Of the 161 radiographs, only two (1.2%) had a profusion score of 1/0 or greater; one film was read as 1/0, the other as 1/1. No control films were read as 0/1; all but the two noted above were lower. When analyzed by Fisher’s exact test (two-sided), the results, \( P = 0.54 \), showed no significant relationship between cigarette smoking and ILO profusion score at or above 1/0.

Logistic regression of smoking within the asbestos-exposed persons and their radiographs demonstrated an association between radiographic profusion and pack-years.

When agreement between the three readers was assessed, there was moderate agreement among them. Between observers 1 and 2 the kappa statistic was 0.56, between 1 and 3, 0.37, and between 2 and 3, 0.48. The overall kappa statistic was 0.47.

DISCUSSION

The major issue addressed by this study was the possible relationship of cigarette smoke exposure and the development of radiographic changes consistent with pneumoconiosis, especially irregular opacities. No such association was found. The finding of two X-rays with irregular opacities among non-asbestos-exposed individuals is not surprising. There are many possible causes of such a reading, in addition to the pneumoconioses. Such markings are seen in small numbers in the general population, also from a wide variety of causes. In a study of blue-collar workers without dust exposure (Castellan et al., 1985), three of 1422 radiographs (0.21%) had ILO scores of 1/0 or higher.

Standard textbooks of radiology (Fraser et al., 1994) have not reported the finding of irregular opacities; rather, the vague term of ‘dirty chest’ has been used, generally meaning that there was a general haziness and lack of sharpness to the chest image, but without specific irregularities.

The finding of an association between smoking and asbestos-related changes has been reported before, and is confirmed here.

Limitations of this study include a small sample size, and the relatively young age of the study subjects. An older group would be needed to study the effect of age on the changes noted by X-ray.

CONCLUSION

No association was found between the development of irregular opacities seen on chest radiographs and smoking.

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REFERENCES


