Asbestosis Among Electricians

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In a cross-sectional study of a small group of non-shipyard electricians, the prevalence of asbestosis, defined as irregular opacities of at least 1/0 profusion, was found to be 15% overall and 25% after 20 years of service. Irregular opacities occurred more frequently among smokers. Cost estimates for asbestos-related disease should include construction electricians in the populations at risk.

Reports of occupational groups with significant "secondary asbestos exposure", eg, construction workers, have been presented only recently.[1-3] Electricians have been included with other maintenance workers in previous studies of asbestos exposure[4,5] and with shipyard workers.[6] Electricians were not included in the most recent projections of asbestos-related disease.[7] No publications have addressed the risk of asbestosis among electricians alone.

Electricians may receive substantial asbestos exposure, especially while performing renovation work. They frequently work in confined spaces with old asbestos insulation. To install or repair equipment, they must strip old asbestos from pipes, beams, and wires. This has usually been done without wetting agents or respiratory protection. Air sampling[8] during renovation work showed 60% of electricians received eight-hour time-weighted average exposures to asbestos exceeding 0.1 fibers/cc (geometric mean for all electricians: 0.13 fibers/cc).

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The International Brotherhood of Electrical Workers (IBEW), Local Number 5, requested a survey of a group of workers after exposure to asbestos during the renovation in a building. Its purpose was to screen electricians for asbestos-related disease and to provide a current data base for assessing future health problems.

Materials and Methods

Subject Selection

Workers were eligible to participate in this survey if they had worked on the renovation of a specific building in the month of May, 1985, during which time asbestos exposure was documented. The names and addresses of 39 members of the IBEW No. 5 were provided by the union. Thirty-eight out of 39 agreed to participate.

Medical Examination

A standard medical and occupational history and physical examination were obtained from all participants. The American Thoracic Society/Medical Research Council questionnaire was completed, including the dyspnea grading by Fletcher et al.[9]

Characterization of Exposure Years

Tenure has often been used as an estimate of the duration and intensity of exposure, since exact values are unknown. Total number of years employed as an electrician was used as the index of exposure. In most cases union membership coincided with this time. However, in a few cases, the subjects involved worked independently as electricians before joining the union. In these instances the earlier dates were used to include the years of possible past asbestos exposure.

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Chest Radiographs

A standard 35.5 cm × 43 cm posterior-anterior chest radiograph using 120 kV at a distance of 10 ft was obtained from all subjects. All films were read blindly. They were read independently by three groups: (1) a Board-certified radiologist (J.H.F.), (2) two A readers (D.K.P., M.J.H.), (3) and a B reader (G.R.O.). Films were sent to a second B reader if there was disagreement on the presence or absence of pneumoconiosis. The 1980 International Labor Organization classification for the grading of pneumoconiosis was used.[10] A film was considered diagnostic of asbestosis if it showed small irregular opacities with a profusion of 1/0 or greater. Pleural changes were also noted.

Spirometry

Spirometry was performed on all participants using an OHIO 822S rolling seal spirometer with microprocessor by a technician certified by the National Institute for Occupational Safety and Health. Guidelines of the American Thoracic Society were used.[11] A minimum of three trials was conducted without nose clips. Subjects stood for the test. Results were compared to predicted values of Knudsen et al.[12] Forced expiratory volume in 1 sec (FEV_1) and forced vital capacity (FVC) were each considered reduced if either fell below 80% of predicted. The FEV_1/FVC ratio was considered reduced if it fell below 70%.

Statistical Analyses

Standard statistical tests were used. Stepwise logistic regression was performed using Biomedical Data Programs for a Personal Computer.

Results

A summary of the results is shown in Table 1. Subjects included 37 men and one woman. They were divided into three groups by tenure: less than 10, 10 to 20, and greater than 20 years. Six people had asbestosis. Prevalence of pneumoconiosis was 8%, 15%, and 25%, respectively. One additional person with 30 years of exposure had only bilateral pleural disease. Persons with asbestosis tended to be older than normal subjects within their tenure groups, although the numbers are not large enough to perform meaningful mathematical comparisons.

All six subjects with asbestosis were current cigarette smokers. All complained of a usual cough or phlegm production for at least three consecutive months, statistically significantly more frequently than smokers without asbestosis ($P = .003$). Smokers were more likely to show parenchymal abnormalities than nonsmokers ($P = .049$ by Fisher's exact test). Three men with asbestosis whereas none without radiologic abnormalities complained of dyspnea (Fletcher grade I). We did contact the person under the age of 30 to ascertain nonoccupational exposure to fibrogenic dusts. No family history of asbestos exposure could be identified.

In an attempt to define more clearly the relative importance of age, pack-years of smoking, and tenure as an electrician in the induction of asbestosis, a stepwise logistic regression analysis was performed. Zero-order correlation coefficients between the three variables (Table 2) were all greater than .5 and statistically significant. The three "independent" variables were therefore not independent (multicolinearity), and the basic assumptions underlying regression analysis were not fulfilled. None of the three variables entered the stepwise logistic regression model: coefficients and their associated level of significance are shown in Table 3.

Discussion

The results of a survey of 38 electricians demonstrated radiologic evidence compatible with asbestosis in approximately 16%. When only those employed 20 or more years are considered, that percentage rose to 25%. By comparison, electricians in shipyards have shown a prevalence of approximately 60%.[6] Because of the small sample size and colinearity between variables, the relative importance of age, pack-years of smoking, and tenure could not be elucidated.

Electricians have demonstrated other asbestos-related health effects in addition to parenchymal disease.

TABLE 1
Findings Among 38 Electricians by Tenure Groups

	Tenure, yr		
	0–10	10–20	>20
Number in group	13	13	12
Mean age (range)	27.6 (22–37)	37.3 (29–52)	49.5 (42–62)
Mean tenure	6	15	28.75
Number with pneumoconiosis	1 (8%)	2 (15%)	3 (25%)
Percent smokers	39%	46%	83%

TABLE 2
Zero-order Correlation Coefficients Between Age, Pack-years of Smoking, and Tenure as an Electrician

	Age	Pack-years	Tenure
Age	—		
Pack-years	0.64*	—	
Tenure	0.95*	0.60*	—

* $P < .001$.

TABLE 3
Coefficients of the Stepwise Logistic Regression Model

Variable	Coefficient	P
Age	0.42	0.22
Tenure	−0.10	0.18
Pack-years	0.04	0.30

Mortality studies involving electricians have shown elevated risks for lung cancer. In a mortality study of craftsmen employed at an English shipyard between 1940 and 1968, Newhouse et al[5] found nine mesothelioma deaths out of 211 total deaths among 1,670 electricians. Selikoff et al[6] have similarly demonstrated increased lung cancer risks for shipyard electricians. Enterline and McKiever[13] found a standardized mortality ratio of 131 for lung cancer in electricians. Two case-control studies reported roughly a twofold excess risk[14,15] for electricians outside of shipyards. The small numbers involved in our survey can only alert us to the fact that enough asbestos exposure takes place in electrical work in construction to cause asbestosis.

Recent proposals have suggested that individuals exposed to asbestos not be screened until after at least 10 years of exposure.[16] No justification for this decision was given, although many physicians agree with those guidelines. In view of the results published here, formal establishment of guidelines might better await systematic screening of working populations where apprentices receive substantial exposure.

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Moscow Summit News

"Reagan is a simple man, a normal man," said Vitaly Korotich, Soviet editor, after Reagan's speech to Moscow culturati. "He likes astrology; maybe he eats spinach; he was an actor. Americans maybe are getting tired of hearing about details of the private lives of their leaders, but we are just getting started. We see this normal man and we want to have a normal man as the leader of our state."

—From "For the Record" in *National Review*, 1988;XL(12):9.