Pulmonary X-Ray and Functional Findings in Electric-Arc Welders

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Received August 30, 1974 / Accepted November 22, 1974

Summary. 37 arc welders were examined; 23 of them had worked for part of the time inside closed cisterns under some of the most hazardous working conditions in Prague where MAC for inert dust was greatly exceeded. Radiographic pulmonary alterations were found in 30 of the subjects. These findings mostly belonged to category 1, type s, t, p (according to ILO classification, 1971); only 4 welders from the high-risk group had developed nodulation type m, n, category 2 after an average of 25 years of welding.

Statistical comparison of 22 arc welders displaying positive X-ray findings but without chronic bronchitis with a control group of 20 persons of comparable age who were normal in a cardiopulmonary respect revealed no significant differences in lung function.

Key words: Electric-Arc Welders - Radiographic Pulmonary Findings - Lung Function.

Fumes generated in welding and inhaled by the welders are still considered the most important harmful substance which affects these workers. Numerous studies point to the possible fibroplastic effects of welding fumes, especially after prolonged exposure [1-6,9,10,12-14]. In Czechoslovakia, pulmonary lesions in electric-arc welders are not considered to be an occupational disease and consequently they are not compensated. However these lesions are not always negligible and thus deserve further attention. For this reason, an analysis of pulmonary X-ray findings in welders hospitalized at the Clinic of Occupational Diseases (Deputy Head Professor K. Rejsek M.D., DSc.), Faculty of General Medicine, Charles University, Prague, was performed together with a detailed examination of their lung function.
MATERIAL AND METHODS

37 arc welders were examined who had been referred to the clinic either because of chronic bronchitis or because of changes detected in their chest X-rays, mainly during preventive abreougraphy performed at high-risk working places in Prague. Only a few of the patients had been referred to the clinic because of pulmonary findings in their co-workers.

Detailed working histories were drawn up for all the patients, for most of them additional data were procured at the pertinent Departments of Occupational Hygiene, and all were subjected to a basic internal examination. The welders were divided into two groups according to the magnitude of occupational hazards.

In the case histories, special attention was devoted to metal-fume fever and signs of chronic bronchitis according to BMRC questionnaire criteria. Chest radiograms were evaluated according to the international classification of ILO 1971 [7]. The lung function testing included FVC, the measurement of TLC and its subdivisions (nitrogen-washout method) and the examination of blood gases of arterialized capillary blood (Astrup technique). All gas volumes measured were corrected to BTPS; blood gas measurements were performed at 38°C.

The following lung function parameters were evaluated: FVC in litres and percentage of predicted (values after Sorinson), FEV$_1$ in % of FVC, TLC in litres, RV in % of TLC, oxygen saturation of hemoglobin (SO$_2$) as a percentage, and oxygen and carbon dioxide partial pressures (NP$_{O2}$ and PCO$_2$) in mm/Hg.

A group of welders with abnormal chest radiograms but without bronchitis of any importance were compared for lung function with a group of 20 males unexposed to dust and normal in the cardiopulmonary respect [8]. Also groups of welders with and without chronic bronchitis were compared. Statistical evaluation was performed by the Student's t-test.

As to smoking habits:
in the welders as well as in control group one half of them were smokers.

RESULTS

Hazard group A consisted of 23 welders from 3 of the most exposed working places in Prague; their age ranged from 30 to 56 with a mean of 42 years and the mean duration of exposure was 18 years with a range of 10 - 32 years. Their work consisted solely of welding; about 13% of their yearly