

Evaluation of alveolar clearance by Tc-99m DTPA radioaerosol inhalation scintigraphy in welders

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Objectives: The welding process produces metal fumes and gases which may affect respiratory health. Technetium-99m diethylenetriaminepentaacetic acid (Tc-99m DTPA) dynamic lung scanning is an easy, noninvasive method to assess disorders of alveolar-capillary barrier permeability secondary to epithelial damage. We aimed to investigate the alveolar clearance by Tc-99m DTPA radioaerosol inhalation scintigraphy in welders, to assess additive effects of exposure to welding fumes and cigarette smoking on clearance rate of alveolar epithelium and to determine the correlation between Tc-99m DTPA aerosol lung scintigraphy and spirometric measurements. **Methods:** Nine nonsmoking welders, 9 smoking welders, and a control group of 6 nonsmokers and 6 smokers were accepted to the study. Tc-99m DTPA radioaerosol inhalation scintigraphy was performed in all subjects. Clearance half time ($T_{1/2}$) was calculated by placing a monoexponential fit on the curves. Penetration index (PI) was also calculated on the first minute image. Pulmonary function tests of welders and control group were compared. **Results:** The mean $T_{1/2}$ values of Tc-99m DTPA of the nonsmoking welders were significantly higher than those of the nonsmoking control group (82.1 ± 24.3 min and 48.1 ± 9.7 min, respectively; $p = 0.003$). The mean $T_{1/2}$ values of Tc-99m DTPA of the smoking welders were higher than those of the smoking control group (53.3 ± 24.5 min and 44.5 ± 9.7 min, respectively; $p = 0.510$). PI of the nonsmoking welders was significantly higher than that of the nonsmoking control group (0.46 ± 0.38 and 0.39 ± 0.46 respectively; $p = 0.004$). PI of the smoking welders was significantly higher than that of smoking control group (0.43 ± 0.38 and 0.37 ± 0.45 , respectively; $p = 0.019$). There was a negative correlation between $T_{1/2}$ value and $FEV_1\%$ ($r = -0.468$, $p = 0.016$), $FVC\%$ ($r = -0.442$, $p = 0.024$) and $FEF_{25-75}\%$ ($r = -0.391$, $p = 0.048$) in the welders and control group. No statistically significant differences were found in the values of the standard pulmonary function tests of any of the subjects. **Conclusions:** Welding seems to decrease alveolar clearance which causes an increase in the penetration index. This was considered to be due to fibrotic changes and increased number of alveolar macrophages induced by welding fumes.

Key words: Tc-99m DTPA radioaerosol inhalation scintigraphy, clearance, pulmonary function, welder