Lung cancer in patients diagnosed with silicosis should be investigated

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A B S T R A C T
Silicosis is an interstitial lung disease developing as a result of inhalation of inorganic silica particles. In silicosis cases developing as a result of environmental and occupational exposure, an increase is observed in Turkey especially depending upon denim sandblasting. We present a 35-year-old female case who was applied to our hospital due to complaint of progressive dyspnea, had a history of working in denim sandblasting for 18 months, were diagnosed with silicosis as a result of high resolution computed tomography (HRCT) and diagnosed with lung adenocarcinoma as a result of transbronchial lung biopsy made due to clinical deterioration and radiological progression within three months. The purpose of this report was to point out that lung cancer can develop in patients followed up with diagnosis of silicosis or radiologic findings in silicosis can be confused with lung cancer.

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1. Introduction
Silicosis is an occupational lung disease occurring due to inhalation of silicon dioxide which is in a crystal structure known as silica, and detected mostly from radiological aspect. In Turkey, in parallel with the increase in number of people working at occupation of denim sandblasting, incidence rate of silicosis has increased, too [1]. The disease of silicosis, which does not have a specific treatment, has three clinical forms as acute, chronic and accelerated. Acute form develops within a period between a few months and 2 years, after intense exposure to silica and mostly in people engaging in denim sandblasting. Chronic form emerges 10 years after the onset of exposure. The accelerated form develops within a shorter period (4–10 years) compared to the chronic form but after a more intense exposure [2]. Mining, road construction, excavation, drilling, tunnel construction, glass, silica, brick, ceramic, porcelain, sand paper production, working in foundries are the work branches causing silica inhalation [3]. Recent reports have stated that there are 1.7 million workers exposed to silica powder in USA, 2 million workers in Europe and more than 23 million workers in China [4,5]. Silica is also a carcinogen and known to cause lung cancer in addition to silicosis [6].

In this report, we represented the case, who worked in denim sandblasting, were followed up with diagnosis of acute silicosis and were diagnosed with lung adenocarcinoma by trans-bronchial biopsy upon clinical and radiological deterioration, in order to highlight that lung cancer can develop in silicosis patients or radiologic findings in silicosis can be confused with lung cancer.

2. Case
The female patient at the age of 35 years applied to our hospital with complaints of dyspnea and coughing lasting for 2 months. In her background, it was stated that she had a history of working in denim sandblasting at a denim factory for last 18 months. She did not have smoking habit. Fever of the patient was 36.8°C, pulse was 96/min., respiratory rate was 25/min., tension arterial was 110/60 mmHg, O2 saturation was 95%; in her respiratory system examination, tiny rales were present In PA chest radiography, common reticulonodular opacities were monitored in both middle and lower zones of hemitorax (Fig. 1). In high resolution computed tomography (HRCT), dispersed ground glass appearances, nodules and septal thickening, and minimal pleural effusion in right hemitorax were observed in all lung parenchyma areas (Fig. 2). During respiratory function test, severe restrictive type of impaired pulmonary function was detected (FEV1:48%, FVC:45%, FEV1/FVC:90). The patient was diagnosed with acute silicosis upon
history, clinical and radiologic findings. The patient was suspended from workplace and was followed up as untreated. Clinical symptoms of the patient were deteriorated within 3 months; in repeated HRCT, intense involvement in sub-pleural interstitium, clarification of interstitial traces, thickening in interlobular septals, diffused ground glass appearance, bilateral pleural effusion (Fig. 3) were observed; bronchoscopy and trans-bronchial biopsy were made. Biopsy pathology was detected to be in accordance with lung adenocarcinoma. The patient became exitus as a result of rapidly progressive clinical deterioration and hypoxemic respiratory failure after a short period of time.

3. Discussion

The case we presented has suggested that patients diagnosed with silicosis should be investigated in terms of lung cancer. In order to prevent delay of diagnosis and treatment in lung cancer cases caused by silicosis or confused with silicosis, lung cancer should be kept in mind in all silicosis patients and suspicious cases should be evaluated by means of biopsy and pathological sampling.

There are numerous studies indicating that exposure to silica causes lung cancer. While some studies state that all silica particles are carcinogenic, some studies report that crystalline silica in the form of quartz or cristobalite dust causes the lung cancer [7]. In a multi-centric study, it was determined that rate of mortality caused by lung cancer related to silica exposure increased at the rate of 37% [8]. In a 44-year cohort study conducted in China, correlation between cumulative silica exposure of 34,018 workers and lung cancer was examined, and it was reported that even low level of silica exposure increased risk of cancer. Again in the same study, it has been emphasized that smoking considerably increased the risk of lung cancer together with silica exposure and even if no silicosis developed, silica exposure itself increased the risk of cancer [9]. Our case worked in denim sandblasting, in which silica exposure occurs, for 18 months; but, she did not have a history of smoking.

Radiologic findings in silicosis cases are variable. In the study conducted by Akgül et al., they examined 60 workers working in denim sandblasting. In 73.3% of these workers, radiologic silicosis findings were determined. While centrilobular nodules were the most frequent radiologic finding at the rate of 63.6%, septal thickening was detected in 31.8% of the cases and icy glass opacities, which are specific to acute silicosis, was found in 18.2% of the cases. In acute form of silicosis, the radiologic findings generally include diffuse alveolar filling pattern, consolidation, ground glass appearances, centrilobular nodules, septal thickening, and tend to be seen in middle and lower zones. Death can be observed due to hypoxemic respiratory failure in the early period [2]. In our case, in line with acute silicosis, dispersed nodules, ground glass appearances and septal thickening were observed in both lung parenchyma areas in HRCT. The patient was diagnosed with acute silicosis since she worked in denim sandblasting. Moreover, there was minimal pleural effusion in right hemitortex which is unexpected among radiologic findings in silicosis. However, sampling could not be made as there was little
fluid. We think that this radiologic finding was caused by lung adenocarcinoma.

Most frequent type of lung cancer is adenocarcinoma. It comprises 30–50% of all lung carcinomas. It is the most common lung cancer type among women, non-smokers and people under the age of 45. Lung adenocarcinoma frequently occurs as a nodule or nodules in periphery of lung. The dispersion can be through haematogenous, lymphogenous, and pleural space and rarely from airway. Lung adenocarcinoma metastases can make interstitial involvement in lungs due to lymphangitic dispersion [10,11]. In follow-ups of our patient, lymphangitic dispersion symptoms were observed in HRTC in 3rd month. The patient became exitus due to hypoxemic respiratory failure after a short period of time.

In conclusion, in cases diagnosed with silicosis, lung cancer can develop or radiologic findings in patients followed up as silicosis can be confused with lung cancer. Therefore, we are of the opinion that the diagnosis should become definitive by means of transbronchial biopsy and/or open lung biopsy when there is a suspicion of lung cancer in patients followed up with diagnosis of silicosis or exposed to silica.

Conflict of interest

The authors declare that they have no competing interests.

References

[1] S. Sahbaz, H. Inonu, S. Ocal, A. Yilmaz, C. Pazarli, A. Yeginsu, et al., Denim sandblasting and silicosis two new subsequent cases in Turkey, Tuberk. Toraks 55 (1) (2007) 87–91.
[2] C.A. Ozmen, H. Nazaroglu, T. Yildiz, A.H. Bayrak, S. Senturk, G. Ates, L. Akyildiz, MDCT findings of denim-sandblasting-induced silicosis: a cross-sectional study, Environ. Health 9 (2010) 17, http://dx.doi.org/10.1186/1476-069X-9-17. Published online 2010 Apr 17.
[3] K. Steenland, E. Ward, Slica: a lung carcinogen, CA Cancer J. Clin. 64 (1) (2014) 63–69.
[4] A. Maciejewksa, Occupational exposure assessment for crystalline silica dust: approach in Poland and worldwide, Int. J. Occup. Med. Environ. Health 21 (1) (2008) 1–23.
[5] Ministry of Health, China’s Health Statistics Yearbook 2011, Peking Union Medical College Press, Beijing, China, 2011.
[6] Y. Liu, K. Steenland, Y. Rong, E. Hnizdo, X. Huang, H. Zhang, T. Shi, Y. Sun, T. Wu, W. Chen, Exposure-response analysis and risk assessment for lung Cancer in relationship to silica exposure: a 44-Year cohort study of 34,018 workers, Am. J. Epidemiol. 178 (9) (2013) 1424–1433.
[7] International Agency for Research on Cancer, Monographs on the evaluation of carcinogenic risks to humans, in: Metals, Particles and Fibres. Lyon, Vol. 100C, International Agency for Research on Cancer, France, 2009.
[8] A. Cassidy, A. ’t Mannetje, M. van Tongeren, et al., Occupational exposure to crystalline silica and risk of lung cancer: a multicenter case-control study in Europe, Epidemiology 18 (1) (2007) 36–43.
[9] Y. Liu, K. Steenland, Y. Rong, E. Hnizdo, X. Huang, H. Zhang, T. Shi, Y. Sun, T. Wu, W. Chen, Exposure-response analysis and risk assessment for lung Cancer in relationship to silica exposure: a 44-Year cohort study of 34,018 workers, Am. J. Epidemiol. 178 (9) (2013) 1424–1433.
[10] R.S. Fraser, N. Colman, N.L. Müller, P.D. Pare, Pulmonary Neoplasm Synopsis of Diseases of the Chest, 2006, pp. 338–422.
[11] Robert J. Mason, V. Courtney Broaddus, John F. Murray, A. Jay, Neoplasms of the Lung Murray and Nadel’s Textbook of Respiratory Medicine, fourth ed., 2005, pp. 1311–1409.