

A rare case of thermoplastic pneumoconiosis: polyvinyl chloride pneumoconiosis: a case report

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Summary. Polyvinyl chloride is a widely used synthetic plastic polymer worldwide. Today, it is used in many areas, such as health, electricity, electronics, and construction, especially in the building sector. It is known to have many harms to human health. Our case is a 39-year-old male patient who has been working in the plastics industry for 16 years. The patient, who was diagnosed with a gastric neuroendocrine tumor while working, applied to us to investigate the relationship between his tumor and work. Although a clear relationship could not be established, it was found that he had pneumoconiosis during the examination. It was thought this was due to the polyvinyl chloride he had been exposed to for years. As a result, pneumoconiosis can also be seen in people working in the thermoplastic industry, apart from classical pneumoconiosis-forming dust such as silica, silicate and coal. It is very important to detect these patients early with screening and prevent exposure.

Keywords: polyvinyl chloride, pneumoconiosis, thermoplastic, polyvinyl chloride pneumoconiosis.

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INTRODUCTION

Pneumoconiosis is defined as a generally irreversible disease characterized by a fibrotic tissue response that develops as a result of the accumulation of inorganic dust in the lungs. The vast majority of pneumoconiosis develops secondary to occupational exposure. Environmental dust exposure is responsible for a very small part of it. The diagnosis of pneumoconiosis is based on a well-acquired occupational history, lung imaging and the inability to explain this imaging finding for any other reason. Radiological findings occur earlier than clinical signs, findings and pulmonary function test changes. The majority (more than 80%) of dust causing disease worldwide are silica, silicates, asbestos and coal dust. The remaining part is pneumoconiosis, which is generally reported as a case developing due to metal powders, human-made mineral fibers (Man-Made Mineral Fiber, MMMF) and various thermoplastics under the name of “other pneumoconiosis” [1].

Thermoplastics soften and can be molded without disintegrating when exposed to heat, harden again when cooled and dissolve in organic solvents. There is a long list of thermoplastics and a wide range of their uses. For example, Polyvinyl chloride (PVC) and Vinyl copolymers, Polyethylene, Polystyrene, Polypropylene, Polycarbonate, Polyester, Polyurethane, Styrene acrylonitrile, ABS, Polyacrylate and Nylon are among them [1].

Polyvinyl chloride is a thermoplastic used in industry for many years. It is known that PVC seriously affects health in long-term exposure (such as Raynaud’s phenomenon, hepatic angiosarcoma, immune complex diseases, acro-osteolysis, and systemic sclerosis). The most well-known of these is hepatic angiosarcoma [2, 3]. Cases of pneumoconiosis have been reported in occupations exposed to PVC dust and fumes. PVC production work, vinyl chloride polymerization bagging work, plastic scrap work and plastic mill cleaning work are among the professions where PVC pneumoconiosis is reported. In PVC pneumoconiosis, micronodular opacities in the upper and lower zones are characteristic of chest radiography. It may be associated with decreased pulmonary function and obstructive pulmonary disease [1].

CASE REPORT

Our case is a 39-year-old male patient diagnosed with a gastric neuroendocrine tumor and applied because he thought it was related to his job. He has been working as a printing computer operator in a plastics industry company for 16 years. Three years ago, he was diagnosed with a neuroendocrine tumor by the Gastroenterology department in an external center with tremors, palpitations and excitement in the hands and feet. He was operated and followed up. The patient was evaluated by us and the relationship of his illness to the chemicals he was exposed to

at work was investigated. A detailed work history of the patient was taken. He works three shifts, six days a week. He was filling the pump of the printing machine with chemicals in accordance with the formulas prepared beforehand. In the examination of documents from the workplace, it was determined that the main component of these substances is polyvinyl chloride. The patient said that he was exposed to intense chemical dust and fumes during this procedure. He had no history of any other dust exposure. He has a ten-pack-year smoking history. No restrictive or obstructive findings were found in the Pulmonary Function Test. There were no abnormalities in biochemical blood tests. High-resolution computed tomography (HRCT) was planned for the patient due to the presence of multiple millimetric nodular areas in the bilateral lower zones, prominent on the left, on the chest X-ray (Figure 1). HRCT reported apical emphysema, interstitial thickenings (“parenchymal bands”), nodular opacities and ground glass areas in both lungs (Figure 2). Occupational exposure was considered as a result of the opinions of Radiology, Chest Diseases, Medical Oncology and Gastroenterology in terms of the origin of the nodules. Additional procedures (such as bronchoscopy and pathological diagnosis) were not required, and the patient was considered to have polyvinyl chloride-induced pneumoconiosis. The chest X-ray of the patient was reported as p/p 1/0 according to the ILO (International Labor Organization).

DISCUSSION

Since polyvinyl chloride is a material with high added value and increasing in today’s industry, its effects on the health system have been instrumental in various research. PVC, which is in the group 1 carcinogen class, is accused of cancer in many organs. Although the most known among them is liver angiosarcoma, it also causes testicular cancer, brain neuroblastoma, lymphoma and lung adenocarcinoma. On the other hand, cases, such as systemic sclerosis, hypertension, due to vascular fibrosis, Raynaud’s phenomenon and pneumoconiosis have also been reported due to fibrogenic tissue reaction [3].

Polyvinyl chloride pneumoconiosis was first reported as a case in 1970 by Szenda [4] et al. In one case, pneumoconiosis and systemic sclerosis were detected in a worker exposed to cumulative polyvinyl chloride dust (ambient measurement $>10 \text{ mg/m}^3$) for more than ten years [2]. In a case report published in 1995, a 58-year-old male patient was found to have a nodular pattern in the upper zones of the chest X-ray after ten years of exposure to Polyvinyl chloride. HRCT of the patient showed a nodular pattern and thickened intralobular septal lines (“parenchymal bands”) in

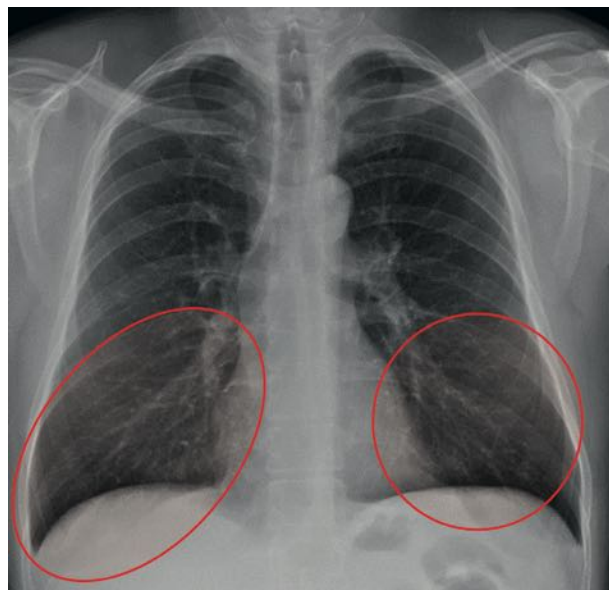


Figure 1. Millimetric nodule image on the patient’s posteroanterior chest X-ray (red areas)

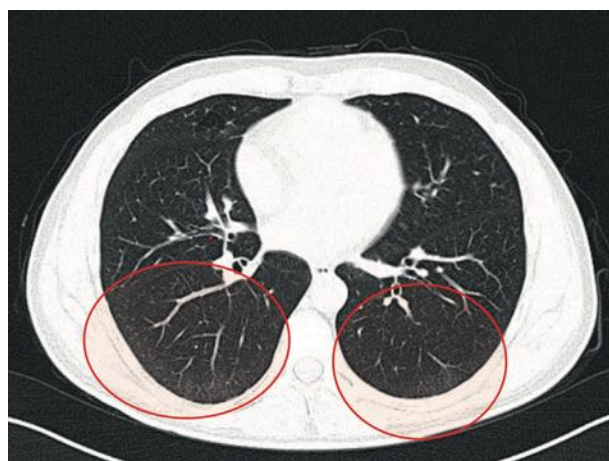


Figure 2. Ground glass and faint millimetric nodules in the patient’s high-resolution computed tomography image (red areas)

the upper lobes, subpleural cysts and traction bronchiectasis in the lower lobes. In the transbronchial lung biopsy performed on this patient, macrophages containing polyvinyl chloride inclusions and

Moksliniai darbai ir apžvalgos

granuloma tissue were detected. HRCT performed one year later revealed scleroderma-like lesions [5]. White et al. reported a case of pneumoconiosis due to heavy PVC exposure in a 35-year-old male patient with dyspnea and restrictive respiratory dysfunction. It was observed that the clinical and radiological findings of the patient improved after weaning from exposure [6]. Workplaces with a polyvinyl chloride dust ambient measurement of more than 10 mg/m³ pose a risk in terms of pneumoconiosis. Exposure to cumulative doses of vinyl chloride dust causes mild small airway disease as well as small nodular opacities in the lungs [7]. A study conducted in Turkey indicates that exposure to polyvinyl chloride dust increases the rate of pathology detection in HRCT by 4.2 times. Unlike irregular/linear opacity and emphysema, round opacity, ground glass pattern and inhomogeneous attenuation were detected only in the PVC exposure group [8].

CONCLUSION

Today tissue diagnosis is not used in the diagnosis of pneumoconiosis. Diagnosis can be made with a detailed occupational history, appropriate differential diagnosis and imaging (HRCT is more sensitive than chest x-ray). Although pneumoconiosis cases in the world and in our country are mostly seen due to silica, silicates, coal dust and metal dust, we know that they sometimes develop due to different exposures. It is important to examine these patients

well, to diagnose them early and to ensure that they are not exposed.

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