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Case Report

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A case of occupational hypersensitivity pneumonia in a welder

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ABSTRACT

A 35-year-old male patient with a history of pigeon breeding was admitted with complaints of shortness of breath, fever, and weight loss. He was referred to occupational diseases clinic due to radiological findings of hypersensitivity pneumonia on thorax high-resolution computed tomography. Firstly, hypersensitivity pneumonia due to pigeon feeding was considered a diagnosis. The patient was instructed to stop the contact with the pigeon. His symptoms improved with oral corticosteroid therapy but recurred upon cessation of the treatment. In the detailed occupational history, it was noticed that he had been doing welding work for 14 years and his complaints increased on the days he worked. The case was diagnosed as hypersensitivity pneumonia due to metal dust contact. The rarity of occupational hypersensitivity pneumonia cases in welding workers makes it important to report individual cases and exposures. Occupational history could be missed in hypersensitivity pneumonia patients, as it is often thought to be caused by contact with organic factors such as pigeon breeding. The importance of occupational history taking is highlighted in the diagnosis of rare diseases such as occupational hypersensitivity pneumonia.

Keywords: Welding, metal workers, hypersensitivity pneumonia, occupational pneumonia, lung diseases

INTRODUCTION

Hypersensitivity pneumonia (HP) is a disease characterized by immunological response and parenchymal changes in the lung, usually resulting from exposure to an organic antigen. Many factors can cause HP. It is most commonly seen in farmers and bird feeders. Occupational HP is defined as a disease characterized by lymphocytic and granulomatous inflammation that develops as a result of occupational exposures such as low molecular weight chemicals and metals, affecting the small airways, alveoli and interstitial tissue.[1] Occupational diseases occur as a result of exposure to risk factors arising from work activities. There is a causal relationship between the disease and the working conditions. Occupational diseases generally do not have a specific treatment and usually have a progressive course. Therefore, in order to prevent the progression of the disease and protect other workers from it, it is important to implement appropriate occupational health and safety measures and eliminate or, if not possible, reduce exposure to the causative factors.

CASE

A 35-year-old male patient, who had no known disease before, was diagnosed with asthma in an external center when he started complaining of dyspnea after upper respiratory tract infection, and inhaler treatment was started. Fever, malaise, and loss of 15 pounds in last 6 months were added to the existing complaint of shortness of breath. Due to the general health precautions taken during the COVID-19 pandemic, respiratory function testing could not be performed. High resolution thorax computed tomography (HRCT) scan revealed widespread millimetric centrilobular ground glass opacities with a tendency to coalesce in both lungs, as well as low density mosaic perfusion areas corresponding to air trapping in the basal segments. these findings were consistent with HP (**Figure 1.a.**).

The patient reported that he had never smoked and had a history of pigeon breeding for six years. It was recommended to avoid the contact with the pigeons and oral methylprednisolone treatment was started. The patient discontinued contact with pigeons but continued with his current occupation. A HRCT scan was performed three months after completing the treatment. It revealed near complete disappearance of ground glass opacities in the parenchyma, which were evaluated in favor of subacute HP (**Figure 1.b**). Upon that finding, the treatment was discontinued.

After two months, the patient's complaints of shortness of breath, cough, and chest tightness relapsed, and fiberoptic bronchoscopy was performed. Bronchoalveolar lavage cytology from the posterior segment of the right upper lobe revealed

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85% of the cells as lymphocytes, 10-12% as macrophages and 2-3% as neutrophils. As a result of the histochemical study, intracytoplasmic iron deposition was observed in approximately 30% of the macrophages with the iron stain and fat deposition in 50% of the macrophages with the lipid stain. In order to investigate the relationship between the patient's current clinical condition and his occupation, a consultation was made to our work and occupational disease clinic. The patient, who has been working in the production of industrial stainless steel for eight years, reported that during the first year, they were involved in cutting, bending, sanding, and welding (electrode, submerged arc, argon) processes with plate shaped stainless steel materials. On detailed occupational history, he stated that he started working in the stainless steel plate cutting business for seven years. Patients both the pre-employment examination and the periodic examination conducted three years ago were evaluated as normal. The patient's blood analysis for heavy metals (Mercury, Lead, Cobalt, Manganese, Cadmium) were within normal range (**Table 1**). It was learned that the patient has been working part-time, 1-2 days a week, in a place where galvanized sheet metal is processed, performing argon and submerged arc welding over the past year. It was noted that the patient's wheezing and shortness of breath complaints got worse, particularly at night, after engaging in welding work.

The stainless steel sheet material obtained from the workplace was chemically analyzed, and it has been reported to contain Fe, Cr, Ni, Zn, Mn, Si, Cu, Mo, Co, N, W, P, C, S, Al, V, Ti, and Nb. Analysis results were within normal range. It should be noted that the materials used in the patient's workplace have changed vastly over the course of 17 years.

In the repeated HRCT scan (**Figure 1.c.**) centrilobular ground glass opacities and mosaic attenuation in the lower lobes were reported; which supported the diagnosis of HP. The patient was started on methylprednisolone again. After four months of treatment, the patient's symptoms significantly decreased. The follow up HRCT scan (**Figure 1.d**) revealed near complete resolution of the lesions. The patient's methylprednisolone treatment was gradually reduced and eventually discontinued. Inhaler steroid therapy (200 mcg budesonide) was initiated. Due to the recurrence of shortness of breath, the dose of inhaler steroid was increased to 400 mcg. The patient's symptoms completely resolved. Considering the patient's occupational history, and clinical and radiological findings, the case was evaluated as occupational hypersensitivity pneumonitis due to heavy metal exposure and responded to steroid treatment. The patient was advised to change his workplace environment.

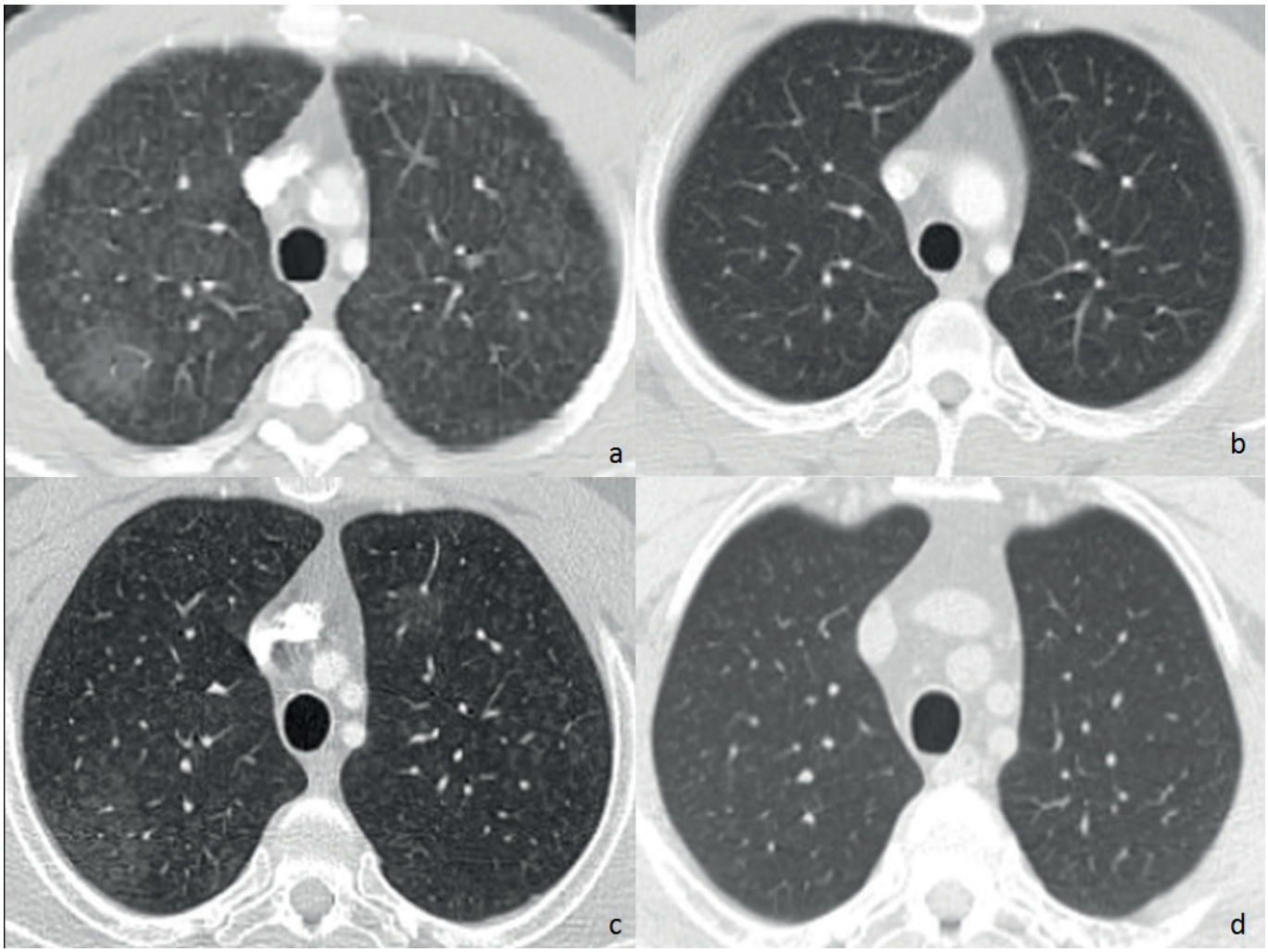

Figure 1. HRCT sections of the patient in different periods
Figure 1.a. HRCT of the thorax in which he was diagnosed with hypersensitivity pneumonia. Diffuse millimetric centrilobular ground glass nodules with a tendency to coalesce in both lungs.
Figure 1.b. Post treatment follow up HRCT. Near complete healing of ground glass opacities, which were evaluated in favor of subacute hypersensitivity pneumonitis.
Figure 1.c. HRCT taken after the recurrence of symptoms following treatment discontinuation. Centrilobular ground glass opacities and mosaic attenuation.
Figure 1.d. Follow up HRCT. Near complete healing of the lesions.

DISCUSSION

Welding is a commonly used process for bonding metals together by melting them under high heat or applying high pressure. The most commonly used welding methods are electric arc welding and gas shielded welding. The materials that are frequently welded include iron, mild steel, and stainless steel. During the welding process, temperatures ranging from 2000 to 3000 degrees Celsius are generated on the welding surface. This heat leads to the release of metal oxides, surface impurities, and various gases into the environment, creating an exposure source. The welding process can create many health problems. The damage it causes especially to the airways and lung parenchyma is important and can affect the respiratory tract at all levels. In differential diagnosis; other pneumoconiosis, hypersensitivity pneumonia, respiratory bronchiolitis, mycoplasma pneumonia are considered.[2] Welder's lung can be considered in the differential diagnosis in our case, but according to the ATS/JRS/ALAT HP guideline's diagnostic criteria for hypersensitivity pneumonitis (HP), our case is consistent with HP based on the typical radiological pattern, lymphocytosis in bronchoalveolar lavage, and clinical history.[3] In a case presentation by Miyazaki et al., similar to our case, HP was diagnosed as a result of exposure to zinc fumes in welding smoke while welding galvanized steel. Just like in our case, the patient improved with oral corticosteroid treatment.[4]

Occupational HP is a rare diagnosis, and in mild cases the diagnosis can be confused with asthma or other respiratory diseases. This suggests that HP may be more prevalent than expected. According to the Republic of Turkey Social Security Institution's 2021 Statistical Yearbook, among the diagnosed 1207 occupational diseases, only 5 cases received a diagnosis of occupational HP.[5] There is no available study specifically regarding the frequency of occupational HP in our country. In a study conducted in the United Kingdom, 818 occupational HP cases were observed in 1.4 million employees between 1996 and 2015.[6] In a study conducted in Japan, out of the 835 cases of HP diagnosed between 1980 and 1989, 115 were identified as occupational HP. Among these 115 cases, the highest number (68 cases) were observed among farmers, followed by 19 cases among industrial workers, and 10 cases among office workers.[7] One of the reasons for the few numbers of cases may be the challenges in the diagnosis. In the discussions related to standardizing the diagnosis of occupational HP, instead of standardizing diagnostic methods and criteria due to the difficulties in diagnosis, it is suggested that centers rely on their own experiences and reach a consensus among multidisciplinary teams when making a diagnosis.[8,9] A detailed medical history provides about 60-80% of the relevant information for a diagnosis, and the medical history alone can lead to a diagnosis in up to 76% of cases.[10] Determining the causative agent of exposure and the improvement of the patient's symptoms upon avoiding that particular exposure further support the diagnosis.[11] In our case, due to economic and social reasons, the patient could not leave or change his job of weldering. It is important to emphasize the significance of obtaining an occupational history and ensuring control in the source, as our patient continues to engage in welding work despite discontinuing pigeon feeding, and the condition is characterized by recurrent HP that is brought under control with oral methylprednisolone treatment but relapses upon treatment cessation. The rarity of occupational HP cases among welders underscores the importance of reporting individual cases and exposures. The patient's symptoms, occupational contact history, typical HRCT findings, clinical improvement with oral methyl prednisolone treatment and recurrence of symptoms after discontinuation of treatment have enabled us to establish a diagnosis of hypersensitivity pneumonitis related to metal dust exposure.[4]

CONCLUSION

The patient's current diagnosis of HP was related to occupational exposure to heavy metal dust and welding fumes. Initially, the patient's history suggested a link between pigeon feeding and HP and contact with pigeons was discontinued. However, the disease relapsed despite treatment, presumably due to the exposure to metal dust and welding fumes in the workplace. the causative agent in HP is often considered as due to the contact with organic factors such as pigeon feding.[12] However, a detailed occupational history should be obtained for a differential diagnosis. In order to ensure occupational health and safety and prevent occupational diseases, source control interventions, such as eliminating exposure, are of paramount importance. If exposure continues, there is a high risk of disease progression and an accelerated transition from a non-fibrotic process to a fibrotic process over time. Therefore, it is crucial to avoid or control exposure to welding fumes and metal dust, either by making changes within the workplace or by transitioning to a different work environment, with the aim of preventing further health risks. Effective ventilation should be provided in areas where exposure to metal dust may occur, or alternatively, the process should be carried out within a closed system. In the diagnosis of rare diseases such as occupational HP, the significance of occupational history should be further emphasized.

ETHICAL DECLARATIONS

Informed Consent: The written consent of the patient was obtained for the article.

Referee Evaluation Process: Externally peer-reviewed.

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