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Case reports

Caplan's Syndrome (rheumatoid pneumoconiosis), a rare disease entity: case report

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Abstract

Caplan's syndrome, known as rheumatoid pneumoconiosis, was first described by Anthony Caplan in 1953, who identified a rare lung disorder found in coal mine workers with rheumatoid arthritis. Although Caplan's syndrome was found in patients with a variety of pneumoconioses, it mostly affects individuals with long exposure to crystalline silica. We present a case of Caplan's syndrome in a patient with advanced stage of rheumatoid arthritis and silicosis.

Keywords: *Caplan's syndrome, rheumatoid pneumoconiosis, rheumatoid arthritis, silicosis, foundry*

Introduction

Caplan's syndrome, also known as rheumatoid pneumoconiosis, was named after the British physician Anthony Caplan, who was the first who identified the entity in coal mine workers. It is a rare condition defined as the association of silicosis and rheumatoid arthritis. The reported prevalence of Caplan's syndrome ranges between 0.4 % and 1.5 % [1]. Although initially described in workers exposed to coal mine dust, its prevalence is higher in those exposed to crystalline silica or diagnosed with silicosis [2, 3]. Here we present a case of Caplan's syndrome in a patient with advanced stage of rheumatoid arthritis and silicosis.

Case report

A 70-year-old man from a rural setting, who had never smoked, worked for 28 years as a foundry molder with exposure to crystalline silica and asbestos fibers (exposure time of 28 years and retention time of 50 years). He presented to our Occupational Medicine Department for exertional dyspnea and polyarthralgia accompanied by swelling of the joints, morning stiffness, deformity, lower back pain and neck pain. He had a history of pulmonary tuberculosis (TB) 19 years before, treated successfully with anti-TB treatment and underwent subtotal thyroidectomy at the age of 18, after which he received thyroid hormone replacement therapy. On admission to our clinic, physical examination revealed a BMI=17.5 kg/m^2, hemangioma of the nasal pyramid, sebaceous cyst in the right subaxillary region, normal respiratory rate, pulse oximetry 98% on room air, auscultation of the chest revealed clear lung fields and cardiovascular system findings within the normal range.

The ECG showed sinus rhythm, heart rate of 62 beats per minute, normal QRS axis (+60 degrees), first-

degree atrioventricular block (PR interval = 210 ms) with flattened T waves in leads V_3-V_6. Lung function investigation showed a mild restrictive defect. Standard chest x-ray revealed tumor formations in the upper third of the lungs' superior lobes and disseminated opacities in both lung fields (Figure 1). The Pneumoconiosis Committee of the Department of Occupational Medicine established the diagnosis of silicosis stage III (B, 3q, hi, tb, pi, em). The CT scan confirmed the pseudotumoral masses of fibrosis.

The physical examination also revealed many osteoarticular changes: hand distal phalanges with ulnar deviation, swelling of the radiocarpal and metacarpophalangeal joints, hands appearance of "camel hump" (Figure 2a, 2b), ulnar deviation of the hands with the appearance of "mole paws", "boutonnière" deformity of the thumb, rheumatoid nodule on the left elbow (Figure 3), decreased mobility of the proximal interphalangeal, metacarpophalangeal and radiocarpal joints, elbows, hyperkyphosis, dextro-convex scoliosis. The x-ray showed an ulnar deviation of bilateral proximal interphalangeal joints, proximal interphalangeal subluxations of the first two digits of his right hand, numerous deformities, erosions, bone misalignments, active synovial hypertrophy of the radiocarpal joints and in the second through fifth metacarpophalangeal joints. Raised levels of inflammatory markers were detected: ESR - 51 mm per hour, fibrinogen - 433 mg/dl, C-reactive protein - 15.25 mg/dl, rheumatoid factor - 109.4 mg/dl. The patient was diagnosed with rheumatoid arthritis based on the ACR/EULAR 2010 Rheumatoid Arthritis Classification criteria [4] and had a disease activity score (DAS28) 5.8, meaning high severity of rheumatoid arthritis per DAS28-ESR. Based on these findings, the final diagnosis was Caplan syndrome.

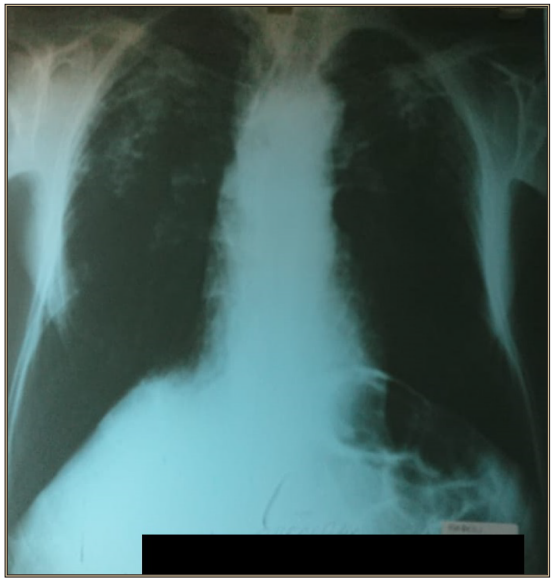

Figure 1. Chest x-ray showing tumor formations in the upper third of the superior lobe of the lungs and disseminated opacities in both lung fields.

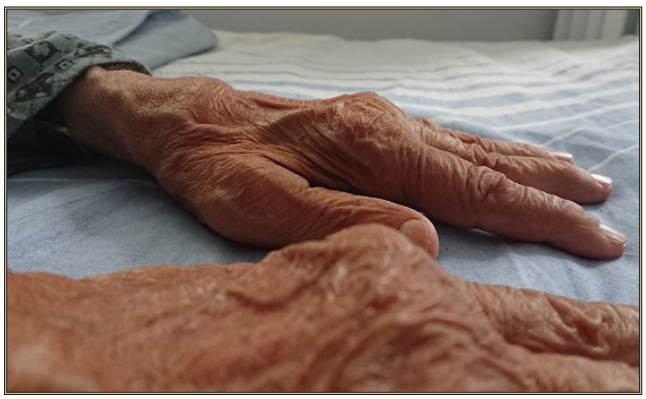

Figure 2b. Osteoarticular changes of the hands' appearance - left hand

Figure 2a. Osteoarticular changes of the hands' appearance - right hand

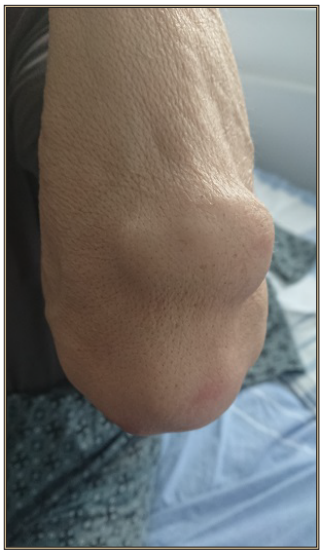

Figure 3. Left elbow rheumatoid nodule

Due to the pulmonary fibrosis, the therapy with methotrexate had contraindications. Instead, the patient received treatment with sulfasalazine. After three months, due to the disease's unfavorable evolution, hydroxychloroquine was added to his treatment. After 12 months of therapy with controls every three months, the patient improved his symptoms and mobility.

Discussion

In 1953, Anthony Caplan identified a distinct syndrome that associated two pathologies that affect different body systems. Initially, he described his findings as an uncommon lung disorder found in coal mine workers with rheumatoid arthritis. In these workers, multiple, well-defined, nodular opacities were noticeable on the chest x-ray, having a variable diameter ranging between 0.5 to a few centimeters, distributed throughout both lung fields, but predominantly at its periphery [5]. These pulmonary lesions were usually noticeable in the presence of mild pre-existing pneumoconiosis, but the evolution of the nodules was variable: some regressed and other progressed. Even more, cavitation, calcification, and a tendency of these opacities to become confluent may frequently occur before, after, or with the onset of rheumatoid arthritis. In cases where these opacities converge, they can no longer be distinguished radiologically from progressive massive fibrosis, as seen in the present case.

In the reported case, the patient worked as a foundry molder for 28 years exposed to pneumoconiogenic particles. Other fields of activity where workers might be at similar risk may include those working in sandblasting, mining, rock drilling, quarrying, brick cutting, glass manufacturing, tunneling, stone working, ceramic manufacturing, or construction activities.

Even though Caplan's syndrome was found in patients with a variety of pneumoconioses [6], it mostly affects individuals with prolonged exposure to crystalline silica [7]. Although the relationship between silica exposure, pneumoconiosis, and rheumatoid arthritis has been well researched [8] and confirmed [9], the pathophysiology of Caplan's syndrome is still under investigation. After crossing the alveolar epithelium, the particles of the breathable fraction of crystalline silica, reach the pulmonary interstitium, where they interact with macrophages, and with specific innate immunity cells. The first stimulus occurs, followed by the death of cells involved in innate immunity. After stimulation, the macrophages produce cytokines (GM-CSF, IL-1, TNF) that further stimulate fibroblasts. Other cytokines induce dendritic cells' maturation, which is another link between innate and adaptive immunity [10]. Also, the sharp edges of free crystalline silica particles cause lysis of lysosomal proteases in macrophages. The cytokines released by macrophages activate the lymphocytes, which produce the autoimmune phenomenon in exposed individuals with genetic predisposition [11].

The prevalence of autoimmune diseases is high in individuals exposed to crystalline silica or diagnosed with silicosis [10]. The most common association is Caplan's syndrome, followed by Erasmus syndrome, which is represented by the silicosis-scleroderma association, Sjögren syndrome, Raynaud's syndrome, and Wegener's disease, autoimmune hemolytic anemia, as well as systemic lupus erythematosus [12].

In the presented case, the patient underwent subtotal thyroidectomy at the age of 18 and who received thyroid hormone replacement therapy for hypothyroidism. This preexisting condition diagnosed from an early age might play an essential role in the development of other immune-mediated pathologies. The relationship between rheumatoid arthritis and disorders of the thyroid gland has been studied both intensively and extensively. The reported prevalence of the association between rheumatoid arthritis and thyroid dysfunction with or without autoimmune causes ranges from 6% to 34% in patients with rheumatoid arthritis [13]. About 25% of those diagnosed with autoimmune diseases tend to associate additional autoimmune disorders. Individuals with thyroid disease are at a higher risk of developing rheumatoid arthritis than those with no disease [14].

Studies have shown that patients who associate rheumatoid arthritis and thyroid disorders have more aggressive disease and a poor outcome, directly affecting the response to the initial treatment [13]. This latter effect may be seen in the reported case, where the patient did not respond well to his first treatment.

Cardiac impairment, such as ischemic heart disease or rhythm and conduction disorders, is commonly found in inflammatory joint disease, possibly due to chronic inflammation and the cardiac conduction tissue fibrosis [15]. Thus, in the present case, the chronic inflammatory syndrome from rheumatoid arthritis may have contributed to the ECG changes that showed the presence of the first-degree atrioventricular block and changes that raised the suspicion of anterolateral ischemia.

The prognosis in the case of Caplan's syndrome is the same as in rheumatoid arthritis, in this case, as in

rheumatoid arthritis, in this case, as in stage IV rheumatoid arthritis.

Conclusion

Although rare, Caplan's syndrome is proof of the complex interaction between environmental and genetic factors that enables undesired immune response that triggers debilitating autoimmune diseases. This case also shows the potential of the pneumoconiogenic particles found in occupational settings to act as an adjuvant in enhancing the adaptive immune response.

References

1. Alaya Z, Braham M, Aissa S, Kalboussi H, Bouajina E. A case of Caplan syndrome in a recently diagnosed patient with silicosis: A case report. Radiology case reports. 2018;13(3):663-6.
2. Schreiber J, Koschel D, Kekow J, Waldburg N, Goette A, Merget R. Rheumatoid pneumoconiosis (Caplan's syndrome). European Journal of Internal Medicine. 2010;21(3):168-72.
3. De Capitani EM, Schweller M, Silva CM, Metze K, Cerqueira EM, Bértolo MB. Rheumatoid pneumoconiosis (Caplan's syndrome) with a classical presentation. Jornal brasileiro de pneumologia: publicacao oficial da Sociedade Brasileira de Pneumologia e Tisilogia. 2009.
4. Kay J, Upchurch KS. ACR/EULAR 2010 rheumatoid arthritis classification criteria. Rheumatology. 2012;51(suppl_6):vi5-9.
5. Tellesson WG. Rheumatoid pneumoconiosis (Caplan's syndrome) in an asbestos worker. Thorax. 1961;16(4):372.
6. Honma K, Vallyathan V. Rheumatoid pneumoconiosis: a comparative study of autopsy cases between Japan and North America. Annals of Occupational Hygiene. 2002;46(suppl_1):265-7.
7. Alaya Z, Braham M, Aissa S, Kalboussi H, Bouajina E. A case of Caplan syndrome in a recently diagnosed patient with silicosis: A case report. Radiology case reports. 2018 Jun 1;13(3):663-6.
8. Calvert GM, Rice FL, Boiano JM, Sheehy JW, Sanderson WT. Occupational silica exposure and risk of various diseases: an analysis using death certificates from 27 states of the United States. Occupational and environmental medicine. 2003;60(2):122-9. Otsuki T, Miura Y, Nishimura Y, Hyodoh F, Takata A, Kusaka M, Katsuyama H, Tomita M, Ueki A, Kishimoto T. Alterations of Fas and Fas-related molecules in patients with silicosis. Experimental Biology and Medicine.2006;231(5):522-33.
10. Benvenuti Pernis: Silica and immune system. Acta Bio-Medica; Atenei Parmensis.2005;76 Suppl 2:38-44.
11. Nemakayala DR, Ramphul K. Caplan Syndrome.
12. Silicoza- Ghid de Practica Medicala, Revista Româna de Medicina Muncii. 2010;61(1-2):4-11.
13. Przygodzka M, Filipowicz-Sosnowska A. Prevalence of thyroid diseases and antithyroid antibodies in women with rheumatoid arthritis. Pol Arch Med Wewn.2009;119:39–43.
14. Emamifar A, Hangaard J, Hansen IM. Thyroid disorders in patients with newly diagnosed rheumatoid arthritis is associated with poor initial treatment response evaluated by disease activity score in 28 joints-C-reactive protein (DAS28-CRP): An observational cohort study. Medicine.2017;96(43).
15. Castaneda S, Gonzalez-Juanatey C, Gonzalez-Gay MA. Inflammatory arthritis and heart disease. Current pharmaceutical design. 2018;24(3):262-80.