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CASE REPORT

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Exacerbated Bronchial Asthma and Hypersensitivity Pneumonitis Triggered by Allergy to Domestic Dogs

Asma bronquial reagudizada y neumonitis por hipersensibilidad provocada por alergia a perros domésticos

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ABSTRACT

We present a case initially interpreted as allergic asthma triggered by dog hair and later confirmed as non-fibrotic hypersensitivity pneumonitis (HP) associated with domestic environmental conditions.

Key words: Bronchial hyperreactivity, Hypersensitivity pneumonitis; Allergy to domestic dogs

RESUMEN

Se presenta un caso clínico interpretado al principio como asma alérgica al pelo de perro y luego documentado como neumonitis por hipersensibilidad (NHS) no fibrótica vinculada al antecedente ambiental doméstico.

Palabras clave: Hiperreactividad bronquial; Neumonitis por hipersensibilidad; Alergia a perros domésticos

CASE REPORT

44-year-old male patient. After adopting 2 dogs, the patient began to show unproductive cough due to bronchospasm, which required periodic visits to the Emergency Room. He was treated with aerosolized salbutamol on-demand because the animals live in an open space in the garden, and in a kennel away from the house. It had been interpreted as bronchial hyperreactivity to dog hair. The patient reported having suffered bronchial asthma from childhood to adolescence, when it had subsided.

He consulted for unproductive cough. The physical examination showed 98% SO_2 and auscultation showed moderate hypoventilation in both hemothorax with little wheezing at the bases. He was medicated with formoterol + budesonide aerosol (160/4.5mcg) tid, and fexofenadine, betamethasone and salbutamol on-demand. At 7 days, he presented very good clinical and symptomatic evolution. The following tests were requested:

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– Lab tests: no particularities.
– Spirometry (with/without bronchodilators): FVC 4390/5410 ml (94/100% predicted), FEV_1 2370/2640 ml (67/76% predicted), FEV_1/FVC: 0.71, response to bronchodilators in FEV_1: 15%.
– High resolution computed axial tomography (HRCAT): inflammatory changes in the bronchial wall and areas of increased attenuation with a "ground-glass" appearance in the posterior segment of the right upper lobe and the apicoposterior segment of the left upper lobe (Figure 1).

The current clinical condition was interpreted as hypersensitivity pneumonitis (HP) with a non-fibrotic phenotype. Oral prednisone was prescribed at a dose of 0.5 mg/kg/day for 15 days, with dose tapering over the following six weeks until complete clinical remission was achieved. At the two-month follow-up, the patient presented good general health and was asymptomatic, with normal respiratory signs. The spirometry showed improved FEV_1 but with persistent moderate airflow obstruction. The HRCAT showed the resolution of the ground-glass opacities (Figure 2). The patient was advised to continue using bronchodilator medication and to adhere to complete vaccination schedules, including influenza, pneumococcal, 2-in-1 for adults, and SARS-CoV-2 vaccines.

COMMENT

Various studies show that 10-20% of the world population is affected by allergies to domestic dogs and cats, which is a health problem.[1-2] Likewise, there are analogous allergies to owls, parakeets, pheasants, chinchillas, and cockatoos.[1-2] Due to the frequent prevalence of dog and cat allergens, there is an essential need to accurately diagnose and

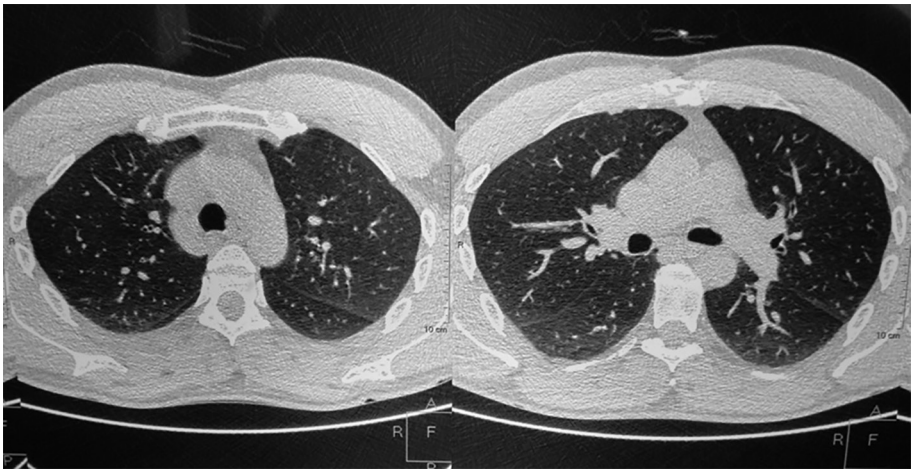

Figura 1. Frosted glass

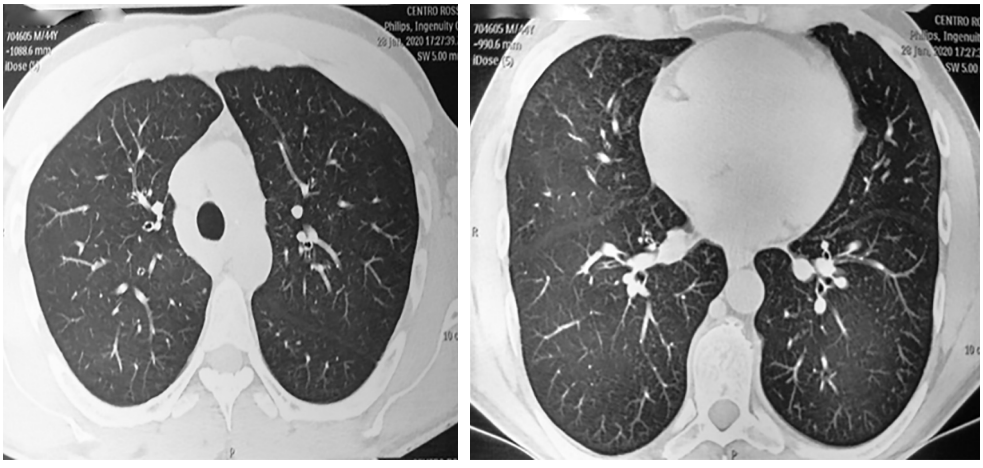

Figura 2. Resolution.

treat this allergy in order to reduce morbidity and mortality from exposure.[1-2] The high prevalence of allergic diseases, including rhinoconjunctivitis and bronchial asthma, is associated with significant individual morbidity as well as high social costs, including the loss of work productivity. Among adults who are allergic to household dogs, asthma exacerbation costs add from $500 to $1,000 million in the United States.[3]

Determinations made by elements of sensitization to allergenic proteins contribute to significantly improve the diagnosis.[4] The ability to accurately identify individuals susceptible to dogs and cats is essential to reduce the burden of asthma and allergic rhinitis by allowing a better assessment of therapeutic efficacy. Unlike patients with allergy to cats, the diagnosis and treatment of patients with allergy to dogs are still a challenge. Continuous exposure to animal allergens leads to sensitization and progression to clinical allergic symptoms.[4] Diagnostic agreement is only 52.2% between skin tests and dog-specific serum allergen IgE test. There is still a great difficulty in using skin prick tests to detect dog allergies in patients. Commercially available extracts used in such tests consist of several proteins whose dosage varies considerably. Domestic animals and humans share and exchange pathogens, microbiomes, and lipocalins through secretions and dermal shedding. The latter can show a faulty load of allergens, and in that case they may induce Th2 hypersensitivity.[5] Allergenic components have been identified in the serum, dander, skin, hair, saliva, and urine of dogs. Initial studies revealed the importance of the allergenic component Can f 1 (canis familiaris allergen 1) suggesting that dander is the preferred source for most commercial preparations of allergenic extracts for dogs.[5] Gradually, canine proteins have been differentiated and isolated. Currently, there are seven canine allergens identified as Can f 1-7 by the International Union of Immunological Societies. Although many are classified as "important" allergens, only 50% of allergic patients react to them, and none of them has been identified as having a high degree of reactivity.[6] With regard to treatment, in order to control clinical symptoms, patients are mostly advised to avoid exposure to the animal. The animals should be bathed two times a week to minimize dander, saliva, skin shedding, and hair.[7] Separation or exclusion of the pet will not contribute to reducing symptoms, especially if there are carpets in the house, since allergens, which are stable, can remain in the environment for up to 6 months. Symptom management with antihistamines and steroids (CS) is used when preventive and therapeutic strategies have already been used but symptoms persist.[7] Finally, subcutaneous immunotherapy is effective, but less effective than for cat allergies. This gradual introduction of allergens at constant and gradually increasing doses over 3 to 5 years is related to changes in the function of Th2 cells to a Th1 phenotype and the induction of regulatory T cells. Publications on dog immunotherapy from 1963 showed symptom attenuation in 11 patients treated with dog allergenic extracts.[7]

Treatment with immunotherapy depends on reliable and safe extracts. The safety of the subcutaneous route is also a concern: if a patient is very sensitive, different batches produced by the same manufacturer with varying amounts of allergenic protein components can lead to adverse reactions when these individuals are suddenly exposed to high levels. Desensitization treatment can also be done intradermally (ID), which may last for 3 to 5 years through the administration by qualified personnel. In the last 20 to 30 years, the sublingual route (SL) has gained gradual recognition. Since the clinical indications for both administration routes overlap, if SL is available, it might be preferred by some patients due to the convenience of administration, although ID is considered more effective.[10]

Exposure to pets has been considered a risk factor for asthma. Takkouche et al examined the association between pet exposure, asthma, and allergic rhinitis through a meta-analysis.[10] In 32 articles, the risk for asthma related to exposure to any pet was 1.39 (95% CI: 1.00-1.95), and for dogs, it was 1.14 (95% CI: 1.01-1.29). Among cohort studies, exposure to cats yielded a relative risk of 0.72 (95% CI: 0.55-0.93), while for allergic rhinitis, the relative risk of exposure to any pet was 0.79 (95% CI: 0.68-0.93)[10]. The authors' conclusion was that exposure to cats has a slight preventive effect on asthma, which is more evident in cohort studies. Exposure to dogs slightly increases the risk of asthma.[10]

The patient of this case had not undergone any diagnostic test to confirm his allergy to dog hair. Instead, he had been treated symptomatically with environmental avoidance measures and preven-

tive inhaled bronchial medication (budesonide/formoterol), antihistamines, and corticosteroids, which had resulted in clinical improvement.

Furthermore, HP is an immune-related disease that manifests in susceptible individuals following exposure to identified or unidentified environmental agents.[11] Several definitions have been proposed, but the experts haven't reached a consensus.[11] According to the new ATS/ERS/ALAT/JRS Guidelines, the characteristic pattern of non-fibrotic HP is identified tomographically by centrilobular nodules, mosaic attenuation during inspiration, air trapping during expiration, and a "ground glass" appearance.[11] In HP, the mosaic attenuation (manifested distinctively) shows that lobes affected by pneumonitis (increased attenuation) alternate with lobes of normal or slightly decreased attenuation due to bronchiolar obstruction.[11] They tend to be bilateral and symmetrical with diffuse distribution, both coronal and axial.[11]Although this pattern of irregularities suggests non-fibrotic HP, isolated air trapping is another potential pattern to be found in this variant. Following the latest evaluation, the patient was interpreted as having the non-fibrotic phenotype of HP. It should have been completed with a bronchoalveolar lavage (BAL).[11] Typically, the presence of a higher lymphocyte count distinguishes fibrotic HP from sarcoidosis and idiopathic pulmonary fibrosis, and non-fibrotic HP from sarcoidosis.[11] Serum determination of IgG against the suspected antigen is also useful, but it is not available in the country.[12] Due to the patient's history of contact, clinical symptoms, HRCAT findings, and therapeutic response, the decision was made to skip this step. The percentage of lymphocytes in the HP BAL is equal to or greater than 20%.[11]The recommended treatment for the non-fibrotic phenotype of HP is prednisone or equivalent at 0.5 mg/kg/day for 1-2 weeks, followed by a gradual reduction to a maintenance dose of 10 mg/day for 2 to 4 weeks. To avoid the adverse effects of CS, mycophenolate and azathioprine can be used, especially in patients who experience relapse or progression when good environmental control is not feasible.[12] The patient responded rapidly to decreasing doses of prednisone over two months. In contrast, for the fibrotic phenotype of HP, with limited evidence, CS can be used alone or in combination with mycophenolate and azathioprine at decreasing doses for up to six months, though a few patients may require lifelong treatment.[12] Rituximab, a monoclonal antibody targeting CD20 could be useful, especially if there is no pattern of usual interstitial pneumonia or non-specific interstitial pneumonia.

Anti-fibrotic drugs like pirfenidone and nintedanib are also being studied for this indication, particularly if the disease progresses with a usual interstitial pneumonia pattern.[12]

In conclusion, we present the case of a patient with allergic asthma triggered by dog hair who later developed non-fibrotic phenotype hypersensitivity pneumonitis (HP). The patient was treated with prednisone for less than three months until discontinuation, resulting in the remission of tomographic images and improvement in respiratory symptoms.

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