



Severe eosinophilic asthma (TH2) – Case report.

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Abstract

Introduction: Th2 lymphocytes recruit eosinophils, promoting the local and systemic synthesis of IgE. Eosinophilic asthma is characterized by increased eosinophil concentrations and type 2 allergic inflammation in the airways, leading to frequent exacerbations and worsening lung function, making it a severe and difficult-to-treat subtype of asthma. This phenotype corresponds to 10% of the asthmatic population.

Clinical case: A 20-year-old man with a history of asthma and atopic dermatitis was admitted to the emergency department with dyspnea, cough, expectoration, a sensation of chest tightness, nasal flaring, intercostal retraction, thoraco-abdominal dissociation, peripheral saturation of 90%, tachycardia 130 bpm, blood pressure 150/90 mmHg and temperature rise of 38°C. On physical examination, edema of the epiglottis and buccal cords was observed; on auscultation, there was expiratory wheezing in both disseminated lung fields.

Diagnostic workshop: Eosinophils 9% (790 μ L). ANCA negative, IgE 10789 UI/ml. Culture of sputum *Aspergillus* Spp. Negative. Chest CT: opacity with left supradiaphragmatic air bronchogram and pleural thickening, with bilateral entrapment and bronchiolitis.

Evolution: He received ampicillin + sulbactam, IV hydrocortisone, inhaled budesonide 400 μ g every 8 hours, salbutamol, and ipratropium 160/4.5 μ g every 8 hours. Difficult-to-control asthmatic patient (th2) with good clinical response, absence of rhonchi and wheezing, and eosinophils within normal ranges. Medical discharge was given prednisone 20 mg every day, and the dose was reduced on the 5th day.

Conclusions: Eosinophilic asthma represents a heterogeneous group of patients who constitute a diagnostic challenge. A practical classifier for this phenotype has yet to be available, but rather the characteristic of rapid response to intravenous and oral steroids.

Keywords:

MeSH: Asthma, Th2 cells, Case reports.

Abbreviations

FeNO: nitric oxide exhaled.

Supplementary information

No supplementary materials are declared.

Acknowledgments

Not declared.

Author contributions

José Ulloa Correa: Conceptualization, data curation, formal analysis, fundraising, research, writing - original draft.

Carmen Arévalo Barahona: Conceptualization, Data curation, Formal analysis, Research, Methodology, Software, Writing – original draft.

Manuel Encalada: Research, Methodology, Software, Writing – review, and editing.

All the authors have read and approved the final version of the manuscript.

Financing

The authors of this article financed the costs of this research. The treatment and procedures are a regular part of the pulmonology service, so they did not constitute an additional cost for the patients.

Availability of data and materials

Not declared.

Introduction

Asthma severely impacts quality of life, mortality, economics, and healthcare utilization [1]. All asthma subtypes were initially considered to be eosinophilic; however, this is currently known not to be the case, and there are phenotypes associated with the underlying type of inflammation [2-4].

"Eosinophilic" asthma, which has sometimes been incorrectly used as a synonym for type 2 asthma, has a molecular mechanism different from that of allergy. In this type, two innate lymphoid cells, ILC2s, could play a central role in the conduction of asthma by eosinophilic inflammation [5]. This involves CD4+ lymphocytes that secrete proteins such as interleukin (IL)-4, IL-5, IL-13, and immunoglobulin E (IgE) that result in the recruitment of cells such as eosinophils, basophils, and mast cells into the airways.

The terminology has recently changed from "Th2 high" to "T2 high," reflecting the identification of nonclassical cells other than CD4+ cells, such as innate lymphoid group 2 (ILC2) cells, which also contribute to this process [6, 7]. This phenotype is characterized by eosinophilia, i.e., a significant number of eosinophils in the blood, airways, and sputum, thickening of the basement membrane, and usually a response to corticosteroids constituting approximately 70% of cases. All cases of severe asthma [3, 4] may be atopic or nonatopic. Patients with eosinophilic asthma could be classified into subtypes that may predict their response to specific therapeutic approaches. Unbiased clustering analyses resulted in the identification of different phenotypes associated with eosinophilic inflammation. These phenotypes are 1) childhood-onset atopic asthma, 2) late-onset eosinophilic asthma in adults, and 3) aspirin-exacerbated respiratory disease (AERD) [5, 8-9].

Although a standard definition for its diagnosis has not yet been developed, blood eosinophilia has the highest precision among biomarkers compared to sputum. Nevertheless, there is potential for a large discrepancy between blood and airway eosinophils. The latter is more sensitive in predicting high Th2 asthma [8].

Blood eosinophil count of 115 cells/mL this value had the highest sensitivity and low specificity for detecting T2 c inflammation [9]. The peripheral eosinophilia cutoff of 300 cell counts/mL is used to describe eosinophilic asthma and can be easily identified at a primary care diagnosis [10, 11]. Peripheral eosinophilia can also be found in other conditions, such as parasitic infections, and therefore lacks specificity [12].

Sputum eosinophils are the most sensitive and specific noninvasive biomarker for eosinophilic airway inflammation [2]; however, a reliable sample is difficult to obtain. A differential cell count of >2% to 3% indicates an underlying eosinophilic inflammatory process and is diagnostic of eosinophilic airway disease [13]. Unfortunately, the diagnostic, monitoring, response, and predictive value of sputum eosinophilia as a biomarker is attenuated by the complex and slow process of induction and quantification of sputum [5].

FeNO (exhaled nitric oxide) is another biomarker of T2 airway inflammation, indicating the activity of the T2

cytokines IL-4 and IL-13, as these cytokines upregulate epithelial iNOS expression, guidelines of the ATS/ERS (American Thoracic Society-ATS) for severe asthma and the Global Initiative for Asthma (GINA) have established a high FeNO > 50 ppb as diagnostic of eosinophilic airway inflammation [14-16].

The importance of type 2 inflammation has been emphasized by recently developed monoclonal antibody treatments for severe uncontrollable asthma phenotypes. Several antibodies have been cleared by the US Food and Drug Administration (FDA) or the European Medicines Agency or are supported by successful phase 3 results: anti-IgE, anti-interleukin (IL)-5, anti-IL-5 receptor, anti-IL-4R α , and anti-thymic stromal lymphopoietin, all of which block type 2 inflammation [17].

Free serum IgE is reduced in response to omalizumab [18] (RCTs), and clinical studies have shown that omalizumab improves asthma control, lung function, and quality of life. Exacerbations, emergency room visits, hospitalizations, and use of oral corticosteroids are reduced; however, the presence of autoantibodies and immune complexes in the allergic airways could prevent the action of omalizumab [19, 20].

Identifying therapeutic responders and nonresponders takes work, as it may take a year or more to observe a reduction in clinical exacerbations. Treatment goals vary and most often involve a combination of clinical signs, including a reduction in symptoms and exacerbation rates, restoration of the sense of smell and general restoration of the state of health. This last point includes the ability to get a good night's sleep and feel more alert. However, these asthma questionnaires only sometimes reflect this variety of sought-after therapeutic goals [21].

The main objective of this report is to present the case of a patient who presents with the T2 asthma phenotype to recognize it, make an immediate diagnosis, address it appropriately, and make the right decision to achieve a better result.

Clinical case

Clinical history

A 20-year-old male patient with a personal pathological history of asthma, atopic dermatitis, and an acute abdomen resolved as mesenteric adenitis. The patient was admitted to the emergency service with symptoms of respiratory failure characterized by dyspnea, cough, expectoration, chest oppression sensation, nasal flaring, intercostal retraction, thoracoabdominal dissociation, peripheral saturation of 90%, tachycardia 130 bpm, blood pressure of 150/90 mmHg and thermal rise of 38 °C. On physical examination, edema of the epiglottis and buccal cords was observed; on auscultation, there was expiratory wheezing in both disseminated lung fields.

Diagnostic workshop

Laboratory tests showed 9% systemic peripheral eosinophilia corresponding to 790 u/ μ L. ANCA negativity and IgE 10789

IU/ml (normal <100 IU/ml) were observed. Specific sputum culture for *Aspergillus* spp. was negative.

Chest tomography documented an opacity with left supradiaphragmatic air bronchogram and pleural thickening. The axial, coronal, and sagittal reconstruction analysis found bilateral entrapment and bronchiolitis signs (Figure 1-4).

Treatment

Treatment was started with ampicillin + sulbactam, inhaled corticosteroid hydrocortisone: budesonide 400 µg every 8 hours, in dual therapy with regulated salbutamol and ipratropium. Symbiont from 160 to 4.5 2 puffs every 8 hours.

Evolution

Difficult-to-control asthmatic patient (th2) with good clinical response, absence of rhonchi and wheezing, and eosinophils within normal ranges. Medical discharge was given prednisone 20 mg every five days and dose reduction.

Discussion

Asthma is one of the most common chronic diseases. Currently, the variability of the clinical, functional, and biological characteristics of patients with asthma is recognized, which has given rise to the concept of phenotypes, that is, different subgroups of patients with observable and common factors that result from the interaction between the genotype and the environment.

The present clinical case represents one of the two most frequent phenotypes of severe eosinophilic asthma, which already had a history of asthma diagnosed in childhood, allergic rhinitis, and elevated total IgE, which, when presenting a state of crisis, could not be controlled in the first instance despite standard treatment.

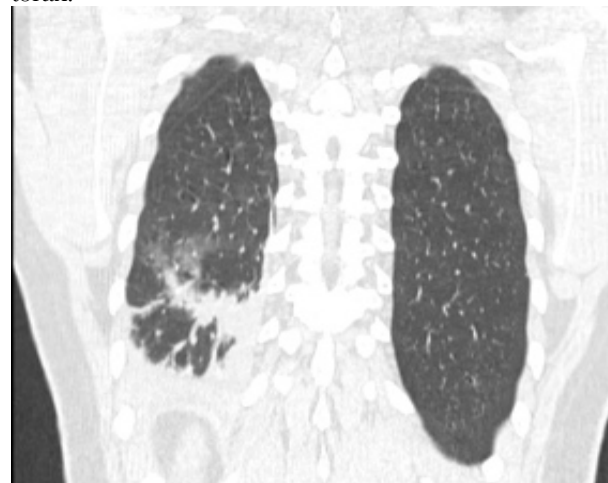
Today, the scientific community is confident about the crucial role that eosinophils play in asthma. Eosinophilic inflammation is present in approximately 50% of patients with asthma and is associated with increased severity, increased frequency of exacerbations, and worsening lung function. Furthermore, poorer asthma control is associated with increased eosinophils in blood and sputum. Therefore, eosinophils again take on a leading role in asthma, and we will see an increase in scientific and clinical interest.

Figura 1. Corte Axial de tomografía de tórax.



Se observa opacidad con broncograma aéreo izquierdo, con engrosamiento pleural.

Figura 2. Corte coronal posterior de tomografía de tórax.



Se observa opacidad con broncograma aéreo derecho, con engrosamiento pleural.

Figura 3. Corte coronal medio de la tomografía de tórax.



Se observa broncograma aéreo, con engrosamiento pleural.

Figura 4. Corte sagital medio de la tomografía de tórax.



Se observa broncograma aéreo, con engrosamiento pleural.

conclusions

Eosinophilic asthma represents a heterogeneous group of patients who constitute a diagnostic challenge. As the understanding of this pathology continues to advance, the development of new therapies will expand for the different

phenotypes, allowing a more personalized and targeted approach to offer better treatment to these patients.

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Statements

Ethics committee approval and consent to participate

Not required for clinical cases.

Publication Consent

Written permission was obtained from the patient to publish the images.

Conflicts of interest

The authors declare they have no conflicts of interest.

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Editor's Note

The Revista Actas Médicas (Ecuador) remains neutral regarding jurisdictional claims on published maps and institutional affiliations.

Received: March 11, 2023.

Accepted: May 19, 2023.

Published: June 12, 2023.

Editor: Dra. Mayra Ordoñez Martínez.

Cite:

Ulloa J, Arévalo C. Severe Eosinophilic Asthma (TH2) – Case report. Actas Médicas (Ecuador) 2023;33(1):49-54.



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