Case Report

Journal of the Royal Society of Medicine Open;
13(3) 1–3
DOI: 10.1177/20542704221086165

Life-Threatening Bronchospasm

Jonathan La-Crette[1], Ahmed Abdelhamid[2], Andrew Chadwick[3] and Arup Chakraborty[4]
[1]Intensive Care Registrar, Milton Keynes University Hospital Trust
[2]ACCS Trainee, Milton Keynes University Hospital Trust
[3]Respiratory and Intensive Care Medicine Consultant, Oxford University Hospital Trust
[4]Acute and Intensive Care Medicine Consultant, Milton Keynes University Hospital Trust
Corresponding author: Dr Jonathan Theophilus La-Crette.
Email: Jonathan.la-crette@nhs.net

Summary

While Eosinophilic Asthma is frequently underdiagnosed, COPD is often misdiagnosed. This case focusses on a COPD misdiagnosis that had life-threatening consequences. The patient was a 59-year-old, male smoker, who presented to the Emergency Department with a week's history of increasing shortness of breath. On presentation, severe respiratory acidosis persisted acidotic despite Nebulisers, Oxygen, Steroids, and Magnesium. He was intubated for two weeks and had severe bronchospasm associated with type 2 respiratory failure. Eosinophils on admission were markedly elevated and remained so despite a week of intravenous steroids. As he missed the window for ECMO, we were advised to look at his diagnostic spirometry. Surprisingly, the spirometry done by his general practitioner, two years prior, showed Asthma not COPD. His blood eosinophils were elevated then, too. A revised diagnosis of Eosinophilic Asthma was given. Intravenous steroids were increased, and nebulised steroids were started. Soon thereafter, his condition improved, and he was stepped down from Intensive care. Hopefully, this case report increases physician knowledge of the different Asthma phenotypes and reduces incidences where correct treatment is only started during an avoidable life-threatening exacerbation.

Keywords

Eosinophilic asthma, bronchospasm, COPD

A 59-year-old, Caucasian male, presented to the emergency department with a weeklong history of increasing breathlessness. He was a life-long smoker and former British Armed Forces cook, who took a Spirolo [long-acting muscarinic antagonist (LAMA) & long-acting beta-2 agonist (LABA)] inhaler, once a day, and a Salbutamol [short-acting beta-2 agonist (SABA)] inhaler, as required. Prior to admission, he was independent and self-caring, walking a few miles every day. His spirometry in 2019 led to a community diagnosis of COPD.

Case presentation

In the emergency department, the patient was in respiratory distress and intubated for severe bronchospasm. He was taken for a CT scan, which was negative for pulmonary embolism. On arrival into the Intensive Care Unit, he was profoundly hypoxic, hypotensive and had absent breath sounds. Bilateral chest drains were inserted for presumed tension pneuomthoraces. The patient remained difficult to ventilate until a bolus of intravenous ketamine was administered.

Initial management

Over the next few days, Aminophylline, Adrenaline, Magnesium and Salbutamol infusions were given. Regular intravenous hydrocortisone, antibiotics, and salbutamol nebulisers were administered. Respiratory PCR was negative for common viruses.

Despite six days of intensive bronchospasm treatment, the patient remained ventilated and in persistent type 2 respiratory failure. A referral was made to an Extracorporeal Membrane Oxygenation (ECMO) centre. It was declined, as his pH was greater than 7.2 and the cause for the elevated pCO2, his bronchospasm, was deemed reversible.

Diagnosis

On Day 9, the admission sputum was positive for Aspergillus Fumigatus, but the Aspergillus PCR and Precipitins were negative. This meant the patient was colonised by, and not sensitised to, Aspergillus. The spirometry in 2019, which showed significant airflow limitation, also illustrated a surprising degree of reversibility (Table 1).

Because the eosinophil count remained unsuppressed despite a week of Hydrocortisone 50 milligrams TDS, after further discussion with the ECMO centre, the steroids were increased: 1 mg of nebulised budesonide BD and Hydrocortisone 100 mg IV TDS.

Prognosis

The following day (D10), there was a rapid deterioration with a rising pCO2 (14 kPa) and pO2 (7.6kPa) despite

Table 1. Results.

Test	Result
Sputum MCS	Aspergillus Fumigatus
Aspergillus Precipitins	Negative
IgE	270 KU/l
Vasculitis screen	Negative
Aspergillus PCR	Negative
Spirometry	FEV1/FVC ratio of 0.7
	FEV1 rose by 37% post-Salbutamol
Echocardiogram	Good biventricular function and a small pericardial effusion
Magnesium and Theophylline levels	Within normal range

100% Inspired Oxygen. A repeat CT showed new bilateral lower lobe consolidation and pleural effusions. The tertiary centre confirmed that the patient was no longer an ECMO candidate due to prolonged invasive ventilation. They suggested proning the patient as a last resort. This was discussed between the consultants looking after the patient and the decision was not taken lightly. Shortly after proning, there was a further deterioration with an increase in pCO2 (17.15kPa).

Case progression and outcome

On day 12, following 16 h of proning, the patient was supinated. ABG showed vastly improved pH and pCO2. Physiotherapy led to thick secretions on suctioning and an improvement in bronchospasm. By day 15, he was breathing spontaneously. A percutaneous tracheostomy was inserted. With tracheostomy in-situ, he was stepped down to a respiratory ward, twenty-five days after entering the ICU. By day 34, he walked out the hospital with a course of prednisolone and a Trimbow inhaler (Steroid, LABA & LAMA) instead of Spiolto Respimat (LAMA & LABA).

Discussion

This case highlights the ease of misdiagnosing adult-onset Eosinophilic Asthma as COPD. Although the "classic" asthma patient is stereotyped as a young female with multiple allergies, De Groot *et al.* showed that adult-onset asthmatics with high blood eosinophils [$>0.3 \times 109\ L-1$] are more often: non-atopic, middle-aged males, with fixed airflow limitation [FEV1/FVC <0.7 post-bronchodilator].[1]

There is increasing recognition of the clinical importance of elevated eosinophils in COPD as well as Asthma. Inhaled corticosteroids (ICS) have been shown to slow lung function decline[2] causing the Global Initiative for Chronic Obstructive Lung Disease (GOLD) to recommend COPD patients with eosinophils greater than $0.3 \times 109\ L-1$ be considered for ICS.[3]

Table 2. Blood eosinophils at time of diagnosis and admission ($10^9\ L-1$).

	March 2021 (Admission)	Jan 2020	Nov 2019 (Diagnosis)
White cell Count [4–11 / 109/L]	15.8	11.9	10.3
Eosinophil Count [0–0.3 / 109/L]	1.6	0.5	0.3

However, ICS-alone may be insufficient to treat severe Eosinophilic Asthma. For these patients, biological therapies targeting the Interleukin-5 (IL-5) component of the T-helper Type 2 (TH 2) lymphocyte inflammatory response have been developed. IL-5 plays a critical role in eosinophil differentiation, maturation, recruitment, and activation.[4] There are currently three NICE approved biologics for severe Eosinophilic Asthma,[5] Mepolizumab, Reslizumab and Benralizumab. These biologics reduce the number of eosinophils through interleukin-5 inhibition and are available on the NHS. Interestingly, a case of Mepolizumab-treated Eosinophilic Asthma has recently been published.[6]

Although not used in this case, sputum testing allows for improved identification of Eosinophilic driven airway inflammation, and draws associations with other biomarkers, such as blood eosinophils.[7] Diagnostic sputum cell counts vary between 1 and 3%.[8]

In conclusion, the patient's demographics, spirometry, and symptoms led to a near fatal misdiagnosis that caused chronic undertreatment for over a year (Table 2). Greater physician knowledge of the different Asthma phenotypes will hopefully reduce occurrences like the case described, where correct treatment (steroids) is only initiated following a life-threatening exacerbation.

Key points

- A label of COPD can be inaccurate
- Eosinophil counts should be noted before initiation of steroids
- Asthma has several different phenotypes
- Steroids have a role in a subset of COPD patients
- Three biologics have been approved by NICE for treating Eosinophilic Asthma

Declaration

Consent: A patient consent form was used to obtain written informed consent for us to publish this case report.

Full list of declarations: Nothing additional to declare.

Declaration of Conflicting Interests: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Jonathan La-Crette https://orcid.org/0000-0003-2960-0846

References

1. de Groot J, Storm H, Amelink M, et al. Clinical profile of patients with adult-onset eosinophilic asthma. *ERJ Open Res* 2016; 2(2): 00100–02015.
2. Agusti A, Fabbri LM, Singh D, et al. Inhaled corticosteroids in COPD: friend or foe? *Eur Respir J* 2018; 52(6): 1801219.
3. 2021 GOLD Reports - Global Initiative for Chronic Obstructive Lung Disease - GOLD [Internet]. Global Initiative for Chronic Obstructive Lung Disease - GOLD. 2021.
4. de Groot JC, Ten Brinke A and Bel EH. Management of the patient with eosinophilic asthma: a new era begins [published correction appears in ERJ Open Res. 2016 Aug 25; 2(3):]. *ERJ Open Res* 2015; 1(1): 00024–2015.
5. Asthma UK Biologic therapies. Asthma UK. https://www.asthma.org.uk/advice/severe-asthma/treating-severe-asthma/biologic-therapies/. Published 2022.
6. McLellan T, Patvardhan C, Rassl D, Jenkins H, Knolle M and Thillai M. Asthma, ECMO and eosinophils. *Thorax* 2021; 76(7): 737–739.
7. Bakakos A, Loukides S and Bakakos P. Severe eosinophilic asthma. *J Clin Med* 2019 Sep 2; 8(9): 1375.
8. Walford HH and Doherty TA. Diagnosis and management of eosinophilic asthma: a US perspective. *J Asthma Allergy* 2014 Apr 11; 7: 53–65.