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Air travel for patients with chronic obstructive pulmonary disease:

a case report

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INTRODUCTION

This case report aims to assist primary care physicians in managing borderline hypoxemic patients with chronic obstructive pulmonary disease (COPD), enabling them to fly safely.

CASE REPORT

A 63-year-old female smoker (80 pack years) travelled from Athens, Greece to Amsterdam in The Netherlands. She had been diagnosed with hypertension, moderate COPD, mild cardiac failure, and severe osteoarthritis in the left knee. Thirty minutes after take-off she started to experience severe dyspnea, without tachycardia or chest pain, that required immediate medical attention. After administering oxygen at 2 L/min, the symptoms slowly improved and she arrived safely in Amsterdam.

The patient had experienced similar symptoms during other flights in the past. Her GP thought that she should be examined by cardiologists and pulmonologists to assess the possible need for in-flight oxygen supplementation. The cardiologist conducted a full clinical examination, as well as an electrocardiogram and heart ultrasound, and decided that, as the cause of the oxygen desaturation during flight was not from her heart, she should be referred to pulmonologists for further assessment.

The pulmonologists conducted spirometry and an arterial saturated oxygen (SaO_2) test. The results were: a forced expiratory volume in 1 second (FEV1) of 60% predicted; an FEV1/forced vital capacity (FVC) of 0.65; and a SaO_2 of 94%. The patient did not perform a 6-minute walking distance test (6MWT) as this was not possible due to the severe osteoarthritis of her left knee. As a hypoxia inhalation test was not available, even in the tertiary hospital, the pulmonologist said that the patient would probably need in-flight oxygen supplementation. This was based only on the available calculations (equations) for determining the need for oxygen supplementation in flight. The pulmonologist did not give precise advice to the patient and, as a result, the patient experienced the same dyspnea during flight as she had done before.

As the patient had experienced severe dyspnoea in previous flights, should her doctors be more careful and prepare her journey in a safer way?

DISCUSSION

COPD is a major public-health problem that, it is estimated, will be the fourth leading cause of death by 2030.[1] Two billion passengers travel each year by airplane;[2] 18–44% have COPD.[3,4] Patients with moderate to severe COPD often develop symptoms due to hypoxia during flight, and most of them do not consult a physician before air travel as they have non-clinically significant hypoxemia at sea level.[3] A study in Norway showed that 25% of the patients with COPD developed hypoxia-related symptoms in flight.[4]

Air pressure drops as altitude increases. The effects of increased altitude and the associated hypobaric features can result in hypoxia. Healthy individuals respond to hypoxia by increasing ventilation, balancing the hypobaric changes without any symptoms. Ventilation can be increased by increasing tidal volume and/or increasing respiratory rate.[5] However, increasing tidal volume for patients with respiratory problems, and especially for those with COPD, is a difficult task as they are often hyperinflated. Patients with respiratory failure will always need in-flight oxygen; it is highly likely that patients with moderate to severe COPD need in-flight oxygen as well.

Investigations

In patients with COPD, previous experiences

Box 1. Guidance to help ensure safe air travel for patients with COPD

For patients

- Plan routes and carriers, and ask for their policy regarding oxygen
- Ask your doctor for the appropriate assessment(s)
- Inform carriers and airport authorities 1 week before departure about your requirements for oxygen during the flight, and transportation to and from the aircraft

For doctors

- Take a full history from patients with respiratory diseases, including previous symptoms during flights, medical history, and comorbidities
- Assess your patient 1 month before departure, taking into account specific trip details
- Provide your patient with formal papers stating the disease and estimated oxygen flow necessary on board
- Use the Frequent Traveller's Medical Card in order to obtain extensive details on medical history for patients who travel frequently by air

For patients and doctors

- Visit the website of the European Lung Foundation (ELF, www.european-lung-foundation.org). The ELF has created a database that gives information and individual oxygen policies for over 300 major airlines in Europe. This is useful as airline policies can vary greatly.

during flights, medical history including GOLD-stage status, dyspnea assessment, and clinical examination should all be assessed. The physiological tests to assess fitness for flight that are currently available are:

- spirometry;
- diffusing capacity tests;
- arterial blood gas tests;
- saturation;
- the 6MWT;
- hypoxemia prediction equations; and
- the hypoxia inhalation test.

Although the practical usefulness of FEV1, partial pressure of oxygen in the blood (PaO_2), and SaO_2 tests in successfully assessing the need for oxygen supplementation is questioned in several publications,[6,7] a rule of thumb is that patients with an SaO_2 of >95% will probably not need oxygen during flight, while those with an SaO_2 of <92% will. Patients with an SaO_2 of 92–95% are considered borderline.[8] The need for oxygen supplementation in patients with COPD during flights can be calculated using different equations. For example:

$$PaO_2 \text{ (mm Hg) (8000 feet)} = (0.238 \times [PaO_2 \text{ sea level}]) + (20.098 \times [FEV1/FVC]) + 22.258.^{9}$$

Although this equation is usually reliable, it might be inaccurate in borderline situations. In such cases, the most accurate test is the hypoxia inhalation test by breathing an oxygen fraction of 15% at sea level; however, this is seldom performed in clinical practice. Patients with a post-hypoxia inhalation test saturation of <85% need in-flight oxygen. Independently, if a hypoxia-altitude simulation test or a hypobaric chamber is used to achieve hypoxia conditions, special caution to oxygen titration is needed — using a nasal cannula underestimates the oxygen dose required. The oxygen delivery equipment can result in the same PaO_2 when a continuous-flow or oxygen-conserving device is used, whereas PaO_2 is lower when portable oxygen concentrators (POCs) are used.[10]

In-flight oxygen is usually prescribed at a rate of 2–4 L/min and should be given by nasal cannulae.[7] This will partially reverse altitude-induced hypoxemia symptoms in patients with COPD.[11] Nowadays, many airlines allow POCs on board, but often only specific types.[7] Box 1 shows a practical guidance to help ensure safe air travel for patients with COPD.

Consent

The patient has provided written consent for this article to be published.

Provenance

Freely submitted; externally peer reviewed.

Competing interests

The authors have declared no competing interests.

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