

High Flow Nasal Cannula as Treatment of Acute Respiratory Distress Secondary to Serious Bronchopneumonia after Transoceanic Flight

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Received: September 19, 2018; **Published:** September 28, 2018

Abstract

The high-flow nasal cannula systems (HFNC) have been a revolution in the treatment of acute and chronic acute respiratory failure. This is due to its broad spectrum of mechanisms of action and its use in several groups of patients (acute and chronic) suffering respiratory failure. International flights are very common in the present days. Some patients present respiratory problems during the flight, most of them, tourist class syndrome. However other respiratory problems can also affect to the passengers of international flights, as is the case of severe pneumonia and respiratory distress. We present the case of a 46-year-old patient admitted for acute hypoxemic respiratory failure secondary to severe bilateral bronchopneumonia in the context of influenza A after a transoceanic flight and who received treatment with high-flow nasal cannula in the pulmonology department.

Keywords: *High Flow Nasal Cannula; Severe Respiratory Failure; Tourist Class Syndrome; Acute Respiratory Distress Syndrome*

Introduction

The high-flow nasal cannula systems (HFNC) have been a revolution in the treatment of acute and chronic acute respiratory failure [1]. Its multiple mechanisms of action that act on different pathophysiological processes, its extensive field of application and the better powerful alternative to non-invasive mechanical ventilation (NIMV) systems. Among its most prominent mechanisms of action is a greater washing of CO₂ by decreasing the nasopharyngeal dead space, the decrease in inspiratory resistance that reduces respiratory work, the contribution of heat and humidity to the air that decreases the metabolic cost and the constrictive response of the nasal mucosa, and increased alveolar recruitment by levels of PEEP and in addition, to counterbalancing the self-PEEP [2]. Likewise, acute or acute on chronic respiratory insufficiency is an entity produced by a great variety of causes; In the case of patients coming from transoceanic flights, the most frequent cause is usually the tourist class syndrome [3]. However, it is important to carry out an integral study of the clinical, analytical and radiological data of the patient to apply a correct treatment that is not only symptomatic but also etiological. We present the case of a 46-year-old patient admitted for acute hypoxemic respiratory failure secondary to severe bilateral bronchopneumonia in the context of influenza A after a transoceanic flight and who received treatment with high-flow nasal cannula in the pulmonology department.

Case Report

A 46-year-old woman with no personal history of interest except an active smoking habit with a pack-year index of 26, who performs a transoceanic flight from Argentina with a stopover in Madrid. She presented a non-specific mild catarrh of 3 days of evolution that had received symptomatic treatment in her country of origin. During the flight she suffers a sudden deterioration of symptoms, with increased dyspnea, general malaise, hyperthermia and pain of pleuritic features in the right hemithorax, so after landing in Madrid is derived from emergency to our hospital due to hypoxemic acute respiratory failure.

Upon arrival at the hospital, she presented tachycardia and significant respiratory work, with baseline oxygen saturation of 87%, fever of 37.8°C and inspiratory rales with a right basal predominance. The chest radiograph showed bilateral infiltrates (Figure 1) and D-dimer gave a value of 815 ng/ml. The electrocardiogram in the emergency department only showed tachycardia, without other significant alterations. The arterial gasometry showed respiratory insufficiency with pO_2 of 51 mmHg, pH of 7.41, pCO_2 of 34 mmHg, HCO_3^- of 21.6 mEq/L, balance of -2.2 and $SatO_2$ 86.1%. An angio-CT scan was performed which rules out the presence of filling defects in the pulmonary arteries. However, the study showed bilateral opacities in ground glass, of diffuse distribution and predominance in upper lobes with arial bronchogram, suggesting as a first diagnostic option bronchopneumonia (Figure 2). The urine sample for legionella and pneumococcus was negative, suggesting infection by possible atypical bacteria. The urgent blood analysis yielded CRP values of 107.1 mg/ml, LDH of 570 U/L, PCT of 0.37 ng/ml and absence of leukocytosis.

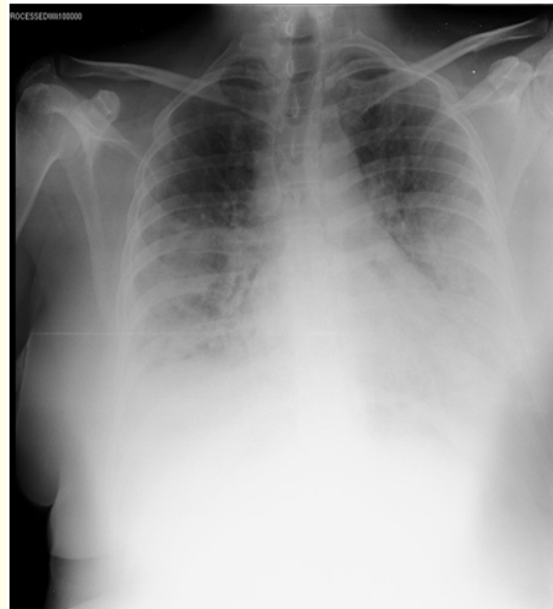


Figure 1: Important parenchymal infiltrate to middle fields, with occupied costophrenic sinuses.

With the diagnosis of bronchopneumonia, the patient enters the pneumology ward to receive broad spectrum antibiotic treatment. At the time of assessing the patient in the plant, it is hypertensive and tachypneic, with significant respiratory work, dyspnea at rest, subcostal retractions and halting speech. The blood analytical control shows PCR of 235.5 mg/L, LDH of 688 U/L and PCT of 0.29 ng/ml. In view of this clinical situation, it was decided to request PCR for influenza virus and to start HFNC for treatment of severe hypoxemic respiratory failure. A flow of 60 L/min, a FiO_2 of 55% and a temperature of 29°C was programmed to achieve a saturation of 92 - 93%. The first control gasometry yields the following results: pH of 7.44, pCO_2 of 38, pO_2 of 73, HCO_3^- of 25.8, balance of 1.7 and oxygen saturation of 95.1% with $PaFiO_2$ of 121. Twenty-four hours after entering the plant A positive PCR result was obtained for influenza virus subtype N1, so a diagnosis of Dlu was made and a treatment with oseltamivir was initiated.



Figure 2: CT scan showing bilateral pulmonary infiltrate in upper lobes.

Seventy-two hours later, the patient begins with cough and clear expectoration. The patient’s clinical situation was significantly better, with decreased respiratory work and dyspnea, although desaturations persist up to 82 - 83% with mobilization.

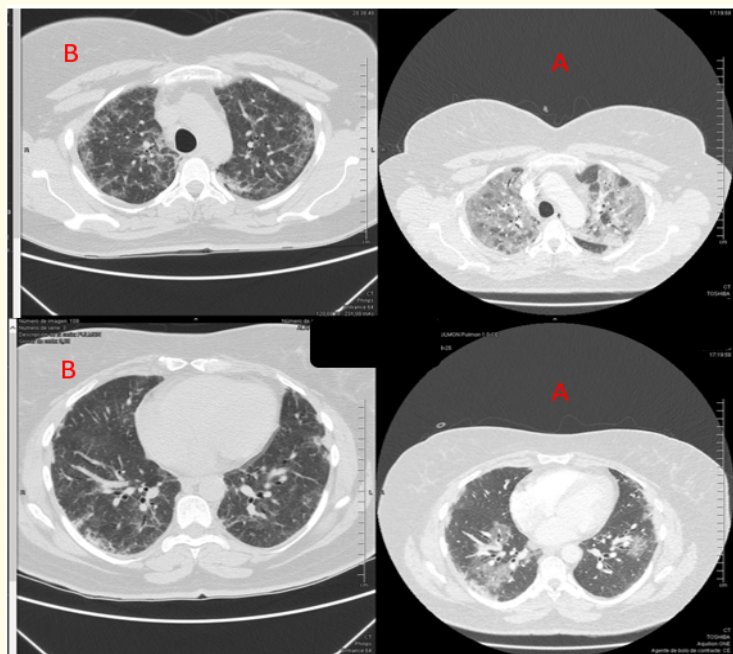


Figure 3: CT scan performed days 1 (A) and 10 (B) of hospitalization. The images show clear improvement and resolution of the infiltrates in the upper lobes (above) and in the middle fields (below).

Ten days after admission, HFNC weaning was started with discontinuous therapy, maintaining HFNC for 3 hours per nursing shift and throughout the night. The rest of the time the patient was with low flow nasal prongs to maintain saturation between 92 - 94%, also allowing free ambulation without ventilatory support for personal hygiene.

After 14 days of hospital admission, the decision was made to be discharged, with the patient being independent for carrying out activities of daily living without the need for supplemental oxygen and maintaining a baseline saturation of 93%. The figure 2 shows the CT scan performed on day 1 and 10 of hospitalization.

Discussion and Conclusion

International flights are very common in the present days. Parallel to its development and commercial growth, pathologies associated with its use have appeared, especially respiratory problems in the case of transoceanic flights lasting more than eight hours. The most popular problem is the tourist class syndrome.

The tourist class syndrome is the name given to thrombotic events that occur after long-distance flights, especially in patients with some risk factor. It was first described in the early fifties and since then there have been many studies that have reaffirmed the appearance of these events linked significantly to the long periods of immobilization imposed by this means of transport. Among its predisposing factors we can find those associated with the plane cabin (immobilization, hypobarism, hypoxia and low humidity), those associated with the passenger (body mass index, thrombophilia, oral contraceptives or hormone replacement therapy, cancer, smoking, age, pregnancy, recent surgery) and the interactions of both that predispose to alterations in blood coagulation. All these factors end up producing a prothrombotic state that favors the formation, release and impaction of thrombi from the lower limbs in the pulmonary circulation.

However, the clinical presentation of the tourist class syndrome is highly nonspecific and can be shared with other syndromes that present with acute respiratory failure such as acute respiratory distress syndrome (ARDS). In both cases hypoxemia of sudden onset, tachypnea, intense dyspnea, pleuritic and substernal chest pain and altered state of consciousness can be observed. In the case of ARDS, to these criteria we must add a relationship between the arterial oxygen pressure (PaO₂) and the inspiratory oxygen fraction (FiO₂), number of quadrants involved in chest radiography and respiratory compliance. This similarity in the clinical presentation obliges the performance of other complementary tests that allow to identify the origin of the same.

The case presented here is of special interest to reflect on the need for a correct differential diagnosis in situations of hypoxemic acute respiratory failure, since the therapeutic etiological approach of the processes is very different depending on the triggering factor. Our patient presented with a highly suggestive syndrome of the tourist class syndrome, which would have had anticoagulant therapy as its main treatment. However, the performance of complementary tests such as CT angiography, blood analysis and PCR of influenza virus, as well as the evaluation of other clinical signs, allowed us to rule out thrombotic pathology in favor of the infectious process and therefore to guide the antimicrobial treatment necessary to treat the triggering cause.

Our patient presented a severe hypoxemic respiratory insufficiency, with great clinical and radiological affectation. The management of acute respiratory failure with HFNC in the pulmonology department is innovative. Several studies have shown that it provides an improvement of the symptoms in the first hour after its application and avoids progressing to invasive measures in many situations. In the case of our patient, her great clinical deterioration, with dyspnea at rest, desaturations with minimal efforts and infiltrates in imaging tests, would have been more than sufficient reason to consult with an intensive care unit and assess the implementation of invasive measures. However, these invasive processes are accompanied by side effects, comorbidities and longer hospital stays. The management of our patient in the ward under strict monitoring allowed avoiding all these processes, with a faster recovery, allowing her to fly back to her country in a shorter time. This also optimized health spending.

The case we present here illustrates two common problems in our medical practice, being necessary to keep in mind that: 1. Not all serious acute respiratory problems that occur in transoceanic flights are due to the tourist class syndrome and 2. The HFNC is an effective treatment applied early in severe respiratory distress.

Conflict of Interest

Authors declare not to have any conflict of interest related to the publication of this manuscript.

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Volume 7 Issue 10 October 2018

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