RBTI
2008:20:2:210-212

CASE REPORT

Noninvasive Mechanical Ventilation in Patient with *Pneumocystis Jirovecii* Pneumonia. Case Report*

Ventilação Mecânica Não-Invasiva em Paciente com Provável Pneumonia por Pneumocystis Jirovecii. Relato de Caso

Élida Mara Carneiro[1], Renata Zago Maneira[2], Eduardo Rocha[3]

SUMMARY

BACKGROUND AND OBJECTIVES: Pneumocystis jirovecii pneumonia has been one of the most common diseases and life-threatening infectious complications in acquired immunodeficiency syndrome patients. The objective of the case report was to present a patient with probable diagnosis of *Pneumocystis jirovecii* pneumonia who received noninvasive positive pressure ventilation.
CASE REPORT: A female patient, 25 years old, with probable diagnosis of *Pneumocystis jirovecii* pneumonia received noninvasive positive pressure ventilation.
CONCLUSIONS: All respiratory parameters progressively improved in the first five days. Results suggest the efficacy of this support to improve oxygenation, to revert hypoxemia and to prevent orotracheal intubation.
Key Words: Acquired immunodeficiency syndrome, Noninvasive ventilation, *Pneumocystis jirovecii*.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A pneumonia por *Pneumocystis jirovecii* tem sido uma das doenças mais comuns e uma complicação infecciosa fatal em pacientes com síndrome da imunodeficiência adquirida. O objetivo deste estudo foi apresentar uma paciente com provável diagnóstico de pneumonia por *Pneumocystis jirovecii* que recebeu ventilação não-invasiva com pressão positiva.
RELATO DO CASO: Paciente do sexo feminino, 25 anos, com diagnóstico provável de pneumonia por *Pneumocystis jirovecii* grave, recebeu ventilação mecânica não-invasiva com pressão positiva.
CONCLUSÕES: Todos os parâmetros melhoraram progressivamente nos primeiros cinco dias. Os resultados sugeriram a eficácia desta medida para otimizar a oxigenação, reverter a hipoxemia e prevenir a intubação traqueal.
Unitermos: *Pneumocystis jirovecii*, síndrome da imunodeficiência adquirida, ventilação não-invasiva.

1. Infectious and Parasitic Disease Unit, Department of Clinical Medicine of the Universidade Federal do Triângulo Mineiro, Uberaba, MG – Physiotherapist Doctor in Sciences by UNIFESP-EPM
2. Graduated Physiotherapist by the Universidade de Uberaba
3. Physiotherapist specialized in Hospital Physiotherapy by UNIUBE - Universidade de Uberaba

*Received from the Hospital Escola da Universidade Federal do Triângulo Mineiro, Uberaba, MG.
• Winner of the Adult Free Theme – Post Graduate in Poster at the 12th International Symposium on Mechanical Ventilation, 3rd National Symposium on Mechanical Ventilation in Pediatrics and Neonatology and 1st Symposium Admission to Mechanical Ventilation in Home Care.

Submitted on December 17, 2007
Accepted for publication on March 26, 2008

Address for correspondence
Elida Mara Carneiro, M.D. UDIP/HE/UFTM
Rua José Pimenta Camargo, 141
38081-230 Uberaba, MG
Phone: (34) 3313-4624
E-mail: elidamc@terra.com.br

INTRODUCTION

The acquired immunodeficiency syndrome (AIDS) is now one of the main risk factors for the development of pneumonia by *Pneumocystis jirovecii*, especially when CD4 lymphocytes levels are below 200 cel/mm^3. Without highly active antiretroviral treatment (HAART), about 60% to 90% of patients develop pneumonia, which in up to 60% of cases may be the first defining event[1].
Infection occurs by inhalatory route and in most persons is asymptomatic. In patients bearers of AIDS, pneumo-

nia may be due to reactivation of the endogenous focus or exogenous re-infection. In the pathogenesis of this infection, injury of the pneumocyte I increases alveolocapillary permeability, with consequent interstitial edema and eosinophilic foamy exudate that fills the alveoli, which explains impairment of gas exchange. These alterations lead to hypoxemia and progressive respiratory failure that may require ventilatory assistance and courses with high morbidity/mortality[2].

The main pysiopathological alterations in these patients include: hypoxemia with increase of the alveolo-arterial oxygen gradient and respiratory alkalosis; decrease of the diffusion capacity suggesting alveolocapillary block and changes in pulmonary compliance as well as in vital capacity and in total pulmonary capacity comparable to that in adult acute respiratory distress syndrome (ARDS)[3].

Noninvasive positive pressure ventilation (NIPPV) is a ventilatory assistance method whereby positive pressure is applied to the patient's airways by a mask and other interfaces without use of tracheal intubation[4]. This procedure is currently indicated for patients with acute hypercapnic respiratory failure (ARF)[5-7] or a high risk of developing it and hypoxemic ARF of different etiologies[8-10].

The purpose of this study was to present a patient with a diagnosis of probable *Pneumocystis jirovecii* pneumonia receiving respiratory NIPPV support.

CASE REPORT

A female patient, 25 year old, admitted at the Unit of Infectious and Parasitic Disease of the Hospital Escola da Universidade Federal do Triângulo Mineiro had a diagnosis of AIDS for the past 5 years. She presented with a clinical condition characterized by dyspneia and non-productive cough associated to a fever, not measured, with several weeks of evolution. Arterial blood gas disclosed severe hypoxemia with partial oxygen pressure (PO_2) of 49 mmHg and chest X-ray showed bilateral, centrifuge and homogeneous interstitial infiltrate, which preserved the periphery. The CD4 count was 53 cells/mm^3 and viral load of 231,189 RNA viral/mL copies. Specific treatments were started with trimethoprim/sulfamethozaxole and hydrocortisone.

During physiotherapeutic evaluation, the patient was using a Venturi mask with a fraction of inspired oxygen (FiO_2) of 50% and a respiratory rate (RR) of 38 bpm and oxygen saturation (SaO_2) of 83%.

Because hypoxemia and dyspneia showed no improvement and after previous written consent of the patient, a NIPPV with Takaoka ventilator was implemented under facial mask with the following parameters: positive end expiratory pressure (PEEP) of 10 cmH_2O, fraction of inspired oxygen (FiO_2) of 80% and support pressure (SP) of 20 cmH_2O. After 30 minutes of respiratory support SaO_2 increased to 96% and on the same day, arterial blood gas showed a moderate improvement of hypoxia with a PO_2 of 73 mmHg. The patient presented a progressive improvement of these parameters until the 5th day, after which an oxygen supplement (3 L/min) was added. It was administered by nasal catheter and remained for two more days with a SaO_2 of 95% to 97% and a PO_2 80 mmHg, whereupon she was discharged from hospital (Table 1).

DISCUSSION

In recent years, use of NIPPV, has become increasingly frequent and this is in part due to publication of well controlled studies that document advantages of this type of mechanical ventilation in comparison to conventional approaches for treatment of acute respiratory failure of various etiologies[1,12,13].

Diagnosis of probable *Pneumocystis jirovecii* pneumonia in this patient was based upon the clinical course, the Roentgenographic image of the interstitial pneu-

Table 1 – Evolution of Ventilatory Parameters

Days	Oxygen Support	FiO_2	PEEP	SP	PO_2	SaO_2
0	VM	50%	-	-	49%	83%
1	NIPPV	80%	10	20	73%	96%
2	NIPPV	60%	13	20	NA	93%
3	NIPPV	40%	15	20	NA	95%
4	NIPPV	40%	14	10	80%	97%

VM: Venturi mask; NIPPV: noninvasive positive pressure ventilation; FiO_2: fraction of inspired oxygen; PEEP: positive end expiratory pressure; SP: support pressure; PO_2: Oxygen partial pressure; SaO_2: Oxygen saturation; NA: Not assessed.

mocyite, the alterations perceived in arterial blood gas and the diagnosis of AIDS. In view of this, since ventilatory parameters did not improve with the Venturi mask, NIPPV was implemented with a facial mask according to data in literature that substantiate its efficacy in conditions of acute respiratory failure. However no reports were found about its use in patients with *Pneumocystis jirovecii pneumonia.*

This type of support improved hypoxemia, that initially was of SaO_2 of 83% with PaO_2 of 49 mmHg and, after implementation of NIPPV went to SaO_2 96% and PaO_2 73 mmHg. This reverted the situation of acute respiratory failure, shortened the time of in-hospital stay in addition to avoiding tracheal intubation. A recent meta-analysis[14] showed the impact of NIPPV on a lesser need for tracheal intubation and also on lower mortality of patients with acute respiratory failure. Such data and improvement of the materials used (masks, other interfaces and flow generating ventilators) have encouraged the use of NIPPV[15].

Noninvasive positive pressure ventilation has a series of advantages in relation to invasive ventilation. It is easy to apply and remove, preserves the upper airways, warrants greater comfort to the patient and avoids the resistive work of breathing of the tracheal tube and complications of intubation itself, such as trauma of the upper airways and/or nosocomial pneumonia[4,16,17]. Furthermore, because ventilators and beds in the ICU in most hospitals are not readily available, this technique becomes more attractive. Results achieved in this case should foster new studies with a larger number of patients to confirm efficacy.

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