



ORIGINAL ARTICLE

High flow nasal cannula oxygen therapy in the treatment of acute bronchiolitis in neonates[☆]

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KEYWORDS

High flow nasal cannula oxygen therapy;
Neonates;
Bronchiolitis;
Invasive mechanical ventilation;
Non-invasive mechanical ventilation

Abstract

Objective: To determine whether the availability of heated humidified high-flow nasal cannula (HFNC) therapy was associated with a decrease in need for mechanical ventilation in neonates hospitalised with acute bronchiolitis.

Methods: A combined retrospective and prospective (ambispective) cohort study was performed in a type II-B Neonatal Unit, including hospitalised neonates with acute bronchiolitis after the introduction of HFNC (HFNC-period; October 2011–April 2015). They were compared with a historical cohort prior to the availability of this technique (pre-HFNC; January 2008–May 2011). The need for mechanical ventilation between the two study groups was analysed. Clinical parameters and technique-related complications were evaluated in neonates treated with HFNC.

Results: A total of 112 neonates were included, 56 after the introduction of HFNC and 56 from the period before the introduction of HFNC. None of the patients in the HFNC-period required intubation, compared with 3.6% of the patients in the pre-HFNC group. The availability of HFNC resulted in a significant decrease in the need for non-invasive mechanical ventilation (30.4% vs 10.7%; $P = .01$), with a relative risk (RR) of .353 (95% CI: .150–.829), an absolute risk reduction (ARR) of 19.6% (95% CI: 5.13–34.2), yielding a NNT of 5. In the HFNC-period, 22 patients received high flow therapy, and 22.7% (95% CI: 7.8–45.4) required non-invasive ventilation. Treatment with HFNC was associated with a significant decrease in heart rate ($P = .03$), respiratory rate ($P = .01$), and an improvement in the Wood-Downes-Férres score ($P = .00$). No adverse effects were observed.

Conclusions: The availability of HFNC reduces the need for non-invasive mechanical ventilation, allowing a safe and effective medical management of neonates with acute bronchiolitis.

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PALABRAS CLAVE

Oxigenoterapia de alto flujo;
Neonatos;
Bronquiolitis aguda;
Ventilación mecánica invasiva;
Ventilación mecánica no invasiva

Oxigenoterapia de alto flujo con cánula nasal en el tratamiento de la bronquiolitis aguda en neonatos**Resumen**

Objetivo: Determinar si el uso de oxigenoterapia de alto flujo (OAF) en cánulas nasales disminuye la necesidad de ventilación mecánica en neonatos hospitalizados con bronquiolitis aguda.

Métodos: Estudio de cohortes ambispectivo, realizado en una unidad neonatal IIB, que incluyó neonatos ingresados con bronquiolitis desde la instauración de la técnica de OAF (período-OAF: octubre de 2011-abril de 2015), comparándolo con una cohorte histórica de la temporada previa a su uso (período pre-OAF: enero de 2008-mayo de 2011). Se analizó la proporción de ventilación mecánica antes y después del inicio del tratamiento con OAF y se evaluaron parámetros clínicos y complicaciones de los pacientes tratados con esta técnica.

Resultados: Se incluyeron 112 neonatos, 56 del período-OAF y 56 de la temporada pre-OAF. En el período-OAF ningún paciente requirió intubación en comparación con la temporada previa, donde el 3,6% precisó ventilación mecánica invasiva. El uso de OAF se asoció con una disminución significativa de ventilación mecánica no invasiva (30,4% vs 10,7%; $p=0,01$), con un RR de 0,353 (IC 95%: 0,150-0,829), RAR de 19,6% (IC 95%: 5,13-34,2) y NNT de 5. En el período-OAF 22 pacientes recibieron terapia de alto flujo y 22,7% de ellos (IC 95%: 7,8-45,4) requirieron ventilación no invasiva. Tras el inicio de OAF se observó una mejoría rápida y progresiva de la frecuencia cardíaca ($p=0,03$), frecuencia respiratoria ($p=0,01$) y escala clínica ($p=0,00$) a partir de 3 h. No se registraron efectos adversos.

Conclusiones: El uso de OAF disminuye la necesidad de ventilación no invasiva y es un tratamiento seguro que consigue mejoría clínica de neonatos con bronquiolitis.

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Introduction

Acute bronchiolitis is the respiratory disease that is the most frequent cause of hospitalisation during the winter months.^{1,2} Although most cases are self-limiting and can be managed in the home, between 1 and 5% require hospital admission, and of the latter, 5–15% require respiratory support at the paediatric intensive care unit (PICU).^{2–6} Age less than 6 weeks is a risk factor for severity, and approximately 30–50% of patients admitted to the PICU are less than 1 month of age.⁴

The treatment of bronchiolitis remains a controversial subject. There is no evidence of any treatment being capable of altering the natural course of the disease, but some treatments may prevent the development of complications and improve patient comfort. The approaches to the management of these patients backed by scientific evidence consist of supportive care and mechanical ventilation.^{2,6–10} In recent years, clinical practice has widely incorporated the use of nebulised hypertonic saline (HTS) in moderate bronchiolitis and of noninvasive ventilation (NIV) and high-flow nasal cannula (HFNC) oxygen therapy as supportive measures to prevent invasive mechanical ventilation (IMV) in patients with severe bronchiolitis.^{6,11–20} Although NIV has proven to be a useful tool in paediatric patients with respiratory failure, its use may be limited in low birth weight infants due to their poor tolerance of the technique.²¹ High-flow nasal cannula therapy is a noninvasive respiratory support technique that delivers a heated and humidified blend of

air and oxygen through nasal cannulae at rates exceeding the peak inspiratory flow, and has proven useful in the management of moderate to severe bronchiolitis.^{14,15,22–27} The effectiveness of this technique compared to CPAP has been assessed in newborns for the treatment of neonatal respiratory distress syndrome,^{28–32} but there is little published evidence on its use in newborns with bronchiolitis.³²

The aim of this study was to determine whether initiation of HFNC oxygen therapy with nasal cannulae in a neonatal unit succeeded in reducing the need for mechanical ventilation in newborns admitted with acute bronchiolitis. We also analysed the clinical outcomes of patients treated with HFOT, as well as the complications that developed.

Patients and methods

We conducted an ambispective cohort study in the level IIB neonatal unit of the Consorcio Hospital General Universitario de Valencia, Spain, which included: (1) a prospective cohort of newborns admitted with bronchiolitis from October 2011, when the use of HFNC oxygen therapy was introduced in the unit, to April 2015 (HFNC period); (2) comparison with a retrospective cohort of newborns admitted with bronchiolitis in the period preceding the introduction of HFNC, from January 2008 to May 2011 (pre-HFOT period).

The diagnosis of bronchiolitis was made following the definition proposed by McConnochie: first episode of respiratory

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