



ORIGINAL ARTICLE

Evolution of non-invasive ventilation in acute bronchiolitis[☆]



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KEYWORDS

Bronchiolitis;
Non-invasive ventilation;
Invasive ventilation;
Children;
Continuous positive airway pressure

Abstract

Objectives: The aim of the study was to analyse the evolution, over a 12-year period, of the use of non-invasive (NIV) and invasive ventilation (IV) in children admitted to a paediatric intensive care unit (PICU) due to acute bronchiolitis.

Patients and methods: A retrospective observational study was performed including all children who were admitted to the PICU requiring NIV or IV between 2001 and 2012. Demographic characteristics, ventilation assistance and clinical outcome were analysed. A comparison was made between the first six years and the last 6 years of the study.

Results: A total of 196 children were included; 30.1% of the subjects required IV and 93.3% required NIV. The median duration of IV was 9.5 days and NIV duration was 3 days. The median PICU length of stay was 7 days, and 2% of the patients died. The use of NIV increased from 79.4% in the first period to 100% in the second period ($p < .0001$) and IV use decreased from 46% in first period to 22.6% in the last 6 years ($p < .0001$). Continuous positive airway pressure and nasopharyngeal tube were the most frequently used modality and interface, although the use of bi-level non-invasive ventilation ($p < .001$) and of nasal cannulas significantly increased ($p < .0001$) in the second period, and the PICU length of stay was shorter ($p = .011$).

Conclusion: The increasing use of NIV in bronchiolitis in our PICU during the last 12 years was associated with a decrease in the use of IV and length of stay in the PICU.

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PALABRAS CLAVE

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Evolución de la ventilación mecánica no invasiva en la bronquiolitis**Resumen**

Objetivos: Estudiar la evolución durante 12 años del uso de la ventilación mecánica invasiva (VMI) y no invasiva (VNI) en niños con bronquiolitis ingresados en una unidad de cuidados intensivos pediátricos (UCIP).

Pacientes y métodos: Estudio retrospectivo observacional de 12 años de duración (2001–2012) en el que se incluyó a todos los niños ingresados con bronquiolitis en UCIP que requirieron VMI y/o VNI. Se analizaron las características demográficas, el tipo de asistencia respiratoria y la evolución clínica, comparándose los primeros 6 años de estudio con los segundos.

Resultados: Se estudió a 196 pacientes. Un 30,1% requirió VMI y un 93,3% VNI. La mediana de duración de VMI fue de 9,5 días y la de VNI de 3 días. La duración de ingreso en UCIP fue de 7 días y falleció un 2% de los pacientes. La utilización de VNI aumentó del 79,4% en el primer periodo al 100% en el segundo periodo ($p < 0,0001$) y disminuyó el de VMI del 46% en el primer periodo al 22,6% en el segundo ($p < 0,0001$). La presión positiva continua en la vía aérea y el tubo endotraqueal cortado fueron la modalidad y la interfase más utilizadas, aunque en el segundo periodo aumentó significativamente el uso de ventilación con 2 niveles de presión ($p < 0,0001$) y de púas nasales ($p < 0,0001$), y disminuyó la duración de ingreso en la UCIP ($p = 0,011$).

Conclusiones: La mayor utilización de VNI en pacientes con bronquiolitis en nuestra unidad en los últimos años se asoció a una disminución de la necesidad de VMI y de la duración del ingreso en la UCIP.

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Introduction

Acute bronchiolitis is the most frequent lower respiratory tract infection in infants and the leading cause of hospital admission in this age group during the epidemic season.

General supportive measures and respiratory support are the mainstay of treatment, as the evidence shows that most pharmacological interventions are not efficacious.^{1–4}

Until a few years ago, a high number of the children with bronchiolitis that developed respiratory failure required invasive mechanical ventilation (IMV), which increased the length of stay and the risk of complications. In recent years, there has been an increase in the use of non-invasive ventilation¹ (NIV), but the effects of this treatment on the use of IMV and clinical outcomes are not well understood.

The aim of this study was to analyse the evolution in the use of IMV and NIV in children with acute bronchiolitis admitted to the paediatric intensive care unit (PICU) over a period of 12 years, with the hypothesis that the increase in the use of NIV would be associated with a reduced need for IMV, shorter lengths of stay and lower mortality.

Patients and methods

We conducted a retrospective observational study of patients admitted to the PICU between January 1, 2001 and December 31, 2012 with a diagnosis of bronchiolitis that required IMV or NIV. Patients that were only treated with high-flow oxygen therapy were not included in the study. We collected data for the following variables: age, sex, need for IMV and NIV, duration of mechanical ventilation, type of NIV:

continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP), interface used (nasal cannula, nasopharyngeal endotracheal tube, nasal mask, oronasal mask), mortality, and length of PICU stay. The indication for IMV or NIV was determined by the physician in charge of the patient based on clinical criteria. We performed the statistical analysis with the SPSS 21 software. Our analysis compared two periods of equal length, the first six years of the study (2001–2006) and the last six (2007–2012). We also compared children less and more than 3 months of age. We chose this cut-off point because this is the age threshold for risk reported by other studies. We compared frequencies and medians using the chi square test and Fisher's exact test. The level of statistical significance was set at $p < .05$.

Results**Characteristics of patients and mechanical ventilation**

Table 1 gathers the characteristics of the patients, mechanical ventilation, and outcomes. We analysed the data of 196 patients with a median age of 2 months (interquartile range [IQR], 1–7 months). Of all patients, 57.6% were male. We found risk factors for severe bronchiolitis in 38.3% of the children. Fifty-nine patients (30.1%) required IMV, and 183 (93.4%) required NIV. Among the patients, 69.9% only required NIV, 6.6% required only IMV, and 23.5% were treated with both. The most frequently used mode of NIV was CPAP (68.3%) and the most frequently used interface was the nasopharyngeal tube (76.5%).

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