



ORIGINAL ARTICLE

High-flow nasal cannula therapy versus non-invasive ventilation in children with severe acute asthma exacerbation: An observational cohort study



J. Pilar^{a,*}, V. Modesto i Alapont^b, Y.M. Lopez-Fernandez^a, O. Lopez-Macias^a,
D. Garcia-Urabayen^a, I. Amores-Hernandez^a

^a PICU, Cruces University Hospital, Plaza de Cruces s/n, Barakaldo 48903, Spain

^b PICU, Hospital Universitari i Politècnic La Fe de Valencia, Avinguda de Fernando Abril Martorell, 106, 46026 Valencia, Spain

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KEYWORDS

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Asthma exacerbation;
Critical care;
Children;
Length of stay

Abstract

Introduction: The present study describes our experience with the high-flow humidified nasal cannula (HFNC) versus non-invasive ventilation (NIV) in children with severe acute asthma exacerbation (SA).

Methods: An observational study of a retrospective cohort of 42 children with SA admitted to a Pediatric Intensive Care Unit (PICU) for non-invasive respiratory support was made. The primary outcome measure was failure of initial respiratory support (need to escalate from HFNC to NIV or from NIV to invasive ventilation). Secondary outcome measures were the duration of respiratory support and PICU length of stay (LOS).

Results: Forty-two children met the inclusion criteria. Twenty (47.6%) received HFNC and 22 (52.3%) NIV as initial respiratory support. There were no treatment failures in the NIV group. However, 8 children (40%) in the HFNC group required escalation to NIV. The PICU LOS was similar in both the NIV and HFNC groups. However, on considering the HFNC failure subgroup, the median length of respiratory support was 3-fold longer (63 h) and the PICU LOS was also longer compared with the rest of subjects exhibiting treatment success.

Conclusions: Despite its obvious limitations, this observational study could suggest that HFNC in some subjects with SA may delay NIV support and potentially cause longer respiratory support, and longer PICU LOS.

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* Corresponding author.

E-mail address: fco.javier.pilarorive@osakidetza.eus (J. Pilar).

PALABRAS CLAVE

Ventilación no invasiva;
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Estatus asmático;
Cuidados críticos;
Niños;
Duración de la estancia

Oxigenoterapia de alto flujo frente a ventilación no invasiva en niños con estatus asmático: estudio observacional de cohortes**Resumen**

Introducción: El objetivo de este estudio es comparar nuestra experiencia con el uso de oxigenoterapia de alto flujo (OAF) frente a la ventilación no invasiva (NIV) en niños con estatus asmático (EA).

Métodos: Estudio observacional de una cohorte retrospectiva de 42 niños con EA ingresados en nuestra Unidad de Cuidados Intensivos Pediátricos (UCIP) con soporte respiratorio no invasivo. El objetivo principal del estudio fue valorar el éxito/fracaso del soporte respiratorio inicial (necesidad o no de escalar a un soporte respiratorio superior). El objetivo secundario fue comparar la duración del soporte respiratorio y del ingreso en la UCIP.

Resultados: Cuarenta y dos niños cumplieron con los criterios de inclusión. Veinte (47,6%) fueron tratados con OAF y 22 (52,3%) con VNI como soporte respiratorio inicial. No hubo fracaso terapéutico en el grupo VNI, si bien 8 niños (40%) del grupo OAF fueron cambiados a VNI. La duración de la estancia en la UCIP y en el hospital fue similar en ambos grupos NIV y HFNC. Sin embargo, en el subgrupo de fracaso de OAF, la duración del soporte respiratorio (el triple, 63 h) y la estancia en la UCIP fueron mucho mayores en comparación con los sujetos que tuvieron éxito en el tratamiento.

Conclusiones: Este estudio observacional, con sus evidentes limitaciones, podría sugerir que el uso de HFNC en algunos sujetos con EA puede retrasar el inicio de la VNI y potencialmente causar un soporte respiratorio más prolongado y una mayor estancia en la UCIP.

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Introduction

Severe acute asthma exacerbation (SA) can be a potentially life-threatening condition¹ and is a frequent cause of admission to a pediatric intensive care unit (PICU).² Endotracheal intubation and invasive mechanical ventilation (invasive MV) are associated with a substantial risk of complications.³⁻⁶ Therefore, the use of other forms of respiratory support such as non-invasive ventilation (NIV)⁷ and high flow nasal cannula (HFNC) have been considered in an attempt to avoid mechanical ventilation in SA subjects.

Despite the fact that NIV is widely used in asthma subjects admitted in ICU⁷⁻¹³ only few randomized controlled studies (RCT) have been published on pediatric population.^{10,13} Nevertheless, there is a strong physiological basis behind the use of NIV in asthma.⁷

On the other hand, HFNC has become popular as it is easy to use and very well tolerated.¹⁴⁻¹⁷ Since last decade, HFNC has been introduced in pediatrics as respiratory support, mainly during seasonal bronchiolitis.¹⁸ Currently, HFNC has spread to hospital wards, emergency rooms¹⁹⁻²¹ and transport services.²²

There is an ongoing discussion on the indications of high flow nasal cannula therapy or non-invasive ventilation (NIV) in subjects with acute respiratory failure. The clinical advantages of HFNC have not been established yet and there is a lack of published evidence comparing NIV and HFNC during SA.

The aim of this study is to describe our experience with HFNC and NIV in children with SA admitted to the PICU.

Patients and methods**Study design**

This is a retrospective observational study in children with asthma exacerbation admitted to PICU for respiratory support.

Setting

A multidisciplinary Pediatric Intensive Care Unit (PICU) from a tertiary university hospital with 12 beds and 600 admissions per year. Our hospital covers a population of 200,000 children within 0-14 years. In 2014, there were 52,335 visits to the Emergency Department (ED) and 4024 hospitalizations per year. With a prevalence of asthma of 10% in the pediatric population, asthma exacerbations count for approximately 5% of the total number of visits to the ED. Of these children, only 82 (3.3%) needed hospital admission and 21 (0.8%) PICU for management.

Patients

Consecutive sampling of all children from 1.5 to 14 years old admitted to the PICU with the diagnosis of SA, from January 2012 to December 2014. The only exclusion criteria was age below 18 months aiming to exclude bronchiolitis.

Acute exacerbation of asthma was considered as an acute episode of increased work of breathing with wheeze and prolonged expiratory phase in a child with similar

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