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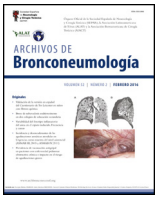

Original Article

Patient Outcome After COPD Exacerbations Requiring Non-invasive Ventilation During Hospitalization☆

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ABSTRACT

Introduction: Noninvasive ventilation (NIV) during hospitalization for acute hypercapnic exacerbations of chronic obstructive pulmonary disease (COPD) has been shown to be effective, but data on the prognosis of such patients is limited. The aim of this study was to investigate in-hospital and long-term outcome in patients with COPD exacerbations requiring NIV treatment during hospitalization.
Methods: Between 2011 and 2013, hospitalized subjects with hypercapnic COPD exacerbations were included in this retrospective single-center cohort study. Subjects' clinical and laboratory data and survival status after a median of 27 months were recorded. The predictive factors of in-hospital and long-term mortality were analyzed.
Results: A total of 574 patients (357 men, mean age 68±11 years) were recorded. During hospitalization, 24 (4.1%) patients died. In-hospital mortality was negatively affected by lower baseline values of hematocrit, albumin, and pH, and by higher baseline leucocytes and higher 24 h $PaCO_2$. Median survival of the cohort was 27 months. Mortality at 3 and 6 months, and 1 year were 14.5%, 19.5%, and 30%, respectively. In the univariate analysis, reduction in long-term survival was found to be related to older age, higher Charlson score, lower baseline levels of hematocrit and albumin, and lower pH level after 24 h. In the multivariate analysis, older age and lower albumin were identified as the strongest predictors of mortality.
Conclusion: Life expectancy after a COPD exacerbation requiring NIV treatment is short. Baseline blood counts and day 2 arterial blood gases levels may predict in-hospital mortality. The strongest indicators of poorer long-term outcome were advanced age and lower albumin. Such patients may need closer follow-up.

Supervivencia en exacerbaciones de la EPOC que requirieron ventilación no invasiva en planta

Palabras clave:
Gasometría arterial
Enfermedad pulmonar obstructiva crónica
Ventilación no invasiva
Insuficiencia respiratoria

RESUMEN

Introducción: La introducción de la ventilación no invasiva (VNI) durante las exacerbaciones agudas hipercápnicas de la enfermedad pulmonar obstructiva crónica (EPOC) en plantas de hospitalización general ha demostrado ser eficaz, pero hay escasos datos sobre el pronóstico de estos pacientes. El objetivo de este estudio fue investigar la evolución intrahospitalaria y a largo plazo de pacientes con exacerbaciones de la EPOC que requirieron terapia VNI durante su ingreso en plantas de hospitalización general.

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Métodos: En este estudio de cohortes retrospectivo y unicéntrico se incluyó a pacientes con exacerbaciones hipercápnicas de la EPOC ingresados en planta entre los años 2011 y 2013. Se recabaron datos clínicos, analíticos y de supervivencia tras una mediana de 27 meses y se analizaron los factores predictivos de la mortalidad durante el ingreso y a largo plazo.
Resultados: Se registraron datos de un total de 574 pacientes (357 varones, edad media 68 ± 11 años). Durante el periodo de hospitalización fallecieron 24 pacientes (4,1%). Se observó que la mortalidad durante la hospitalización era mayor en los pacientes que presentaban concentraciones de hematocrito y albúmina más bajas y recuentos leucocitarios más altos en el momento del ingreso, y en aquellos con pH bajo y $PaCO_2$ alta 24 h más tarde. La mediana de tiempo de supervivencia de esta cohorte fue de 27 meses. Las tasas de mortalidad a los 3 y 6 meses y a un año fueron del 14,5, 19,5 y 30%, respectivamente. En el análisis univariante, se observó que la menor supervivencia a largo plazo estaba relacionada con la edad avanzada, un índice de Charlson alto y concentraciones de hematocrito y albúmina bajas en el momento del ingreso, y un pH bajo al cabo de 24 h. En el análisis multivariante, los factores de predicción de la mortalidad más sólidos fueron la edad avanzada y las bajas concentraciones de albúmina.
Conclusión: Tras una exacerbación de la EPOC que haya requerido VNI, la esperanza de vida es corta. El hemograma inicial y los resultados de la gasometría arterial del segundo día pueden pronosticar la mortalidad durante la hospitalización. Los indicadores más sólidos de mala evolución a largo plazo son la edad avanzada y las bajas concentraciones de albúmina. Es posible que estos pacientes requieran un seguimiento más estrecho.

Introduction

Chronic obstructive pulmonary disease (COPD) is the fourth leading cause of mortality in the world and is expected to become the third leading cause of death by 2020.[1,2] Acute exacerbations of COPD worsen the quality of life of sufferers and increase hospital admissions and mortality.[3] One fifth of patients with exacerbations have acute hypercapnic respiratory failure (AHRF) on admission.[4] In AHRF, noninvasive ventilation (NIV) has been shown to decrease complications, shorten hospital stay and reduce mortality. NIV is therefore proposed as the first line therapy in eligible patients.[5–7] To date, there is no consensus as to whether it is safe to use NIV in non-intensive care units (non-ICU). Although there is no agreement on the proper location for managing these patients, NIV implementation in respiratory and general wards has proved safe and effective.[8–11]

There have been a number of studies on the outcome of COPD exacerbations and the prognostic factors for survival.[12–17] Fewer studies have focused on the outcome of AHRF, and those that are published were mostly conducted in intensive care unit (ICU).[18–21] NIV is becoming more widespread and the number of experienced staff is increasing every day.[8] Only a few studies have investigated the prognosis of such patients treated specifically in non-ICU clinics,[10,22,23] but prognosis has been reported to be poor with a 5-year mortality rate of 70%.[22,23]

This study investigated COPD patients with AHRF, hospitalized in general wards. The objective of the study was to determine predictors for in-hospital mortality, long-term outcome, and long-term survival.

Methods

This was a retrospective, single-center observational cohort study. Between May 2011 and May 2013, all COPD exacerbations requiring NIV treatment in the emergency department (ED) were recorded. Subjects were selected from the hospital electronic database using the ED intervention code for NIV implementation. Of those, individuals with an ICD-10 code of COPD (J44) were included. Subjects with an ICD-10 code of pneumonia (J15), interstitial lung disease (J84), and restrictive lung disease (M41) were excluded. Patients who were transferred directly to the intensive care unit (ICU) were also excluded. Cases who were admitted more than once in the study period were included only in terms of their first intervention (Fig. 1). All patients had been diagnosed with COPD by a pulmonologist who evaluated spirometry, forced expiratory volume in 1 s (FEV1) of 70% predicted or less, and an FEV1 and forced vital capacity (FVC) ratio≤70%.[24] Spirometry test results were not available from the patient charts.

Organization of ED and the Hospital Wards

The study was conducted in a teaching and research hospital, which is a reference center for chest diseases with the largest bed capacity (628 beds) in the country. Facilities include a third level respiratory ICU (34 beds). In the ED, pulmonologists (one chest disease specialist and two chest disease fellows) are available 24 h a day. The number of patients attended in ED differs depending on the month, but an average of 100 and 250 patients are seen every day. At the time of starting the study, the department had 10 years' experience of using NIV. All pulmonologists, chest disease fellows, ED and ward nurses attend intermittent theoretical and practical sessions on the implementation of NIV imparted by the respiratory ICU team.

In ED, the decision to implement NIV is made by the chest disease specialists, according to the clinical status and arterial blood gas levels of the subject at admission, using the following criteria: moderate or severe dyspnea, tachypnea, accessory muscle use, abdominal paradoxical respiration, arterial blood gas (ABG) pH<7.35, and partial arterial carbon dioxide pressure ($PaCO_2$)>45 mmHg.[25] When the need has been determined, NIV is initiated along with oxygen supplementation, corticosteroid and bronchodilator treatment. The acute response to the treatment is evaluated within the first 2 h. If clinical and ABG parameters improve, patients are transferred to general wards. Patients with worsening clinical condition or inadequate improvement are transferred to the ICU. The decision regarding ICU transfer decision is taken by pulmonologists, in consultation with ICU specialists.

In the hospital wards, in addition to their NIV, all patients receive nebulized bronchodilators, IV corticosteroids (0.5 mg/kg), parenteral antibiotics (most frequently β-lactam/β-lactamase