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ORIGINAL

Effectiveness and predictors of failure of noninvasive mechanical ventilation in acute respiratory failure☆,☆☆

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KEYWORDS
Acute respiratory failure;
Noninvasive ventilation;
COPD;
Postextubation respiratory failure

Abstract
Objective: To assess the effectiveness and identify predictors of failure of noninvasive ventilation.
Design: A retrospective, longitudinal descriptive study was made.
Setting: Adult patients with acute respiratory failure.
Patients: A total of 410 consecutive patients with noninvasive ventilation treated in an Intensive Care Unit of a tertiary university hospital from 2006 to 2011.
Procedures: Noninvasive ventilation.
Main variables of interest: Demographic variables and clinical and laboratory test parameters at the start and 2 h after the start of noninvasive ventilation. Evolution during admission to the Unit and until hospital discharge.
Results: The failure rate was 50%, with an overall mortality rate of 33%. A total of 156 patients had hypoxemic respiratory failure, 87 postextubation respiratory failure, 78 exacerbation of chronic obstructive pulmonary disease, 61 hypercapnic respiratory failure without chronic obstructive pulmonary disease, and 28 had acute pulmonary edema. The failure rates were 74%, 54%, 27%, 31% and 21%, respectively. The etiology of respiratory failure, serum bilirubin at the start, APACHE II score, radiological findings, the need for sedation to tolerate noninvasive ventilation, changes in level of consciousness, PaO_2/FIO_2 ratio, respiratory rate and heart rate from the start and 2 h after the start of noninvasive ventilation were independently associated to failure.

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Conclusions: The effectiveness of noninvasive ventilation varies according to the etiology of respiratory failure. Its use in hypoxemic respiratory failure and postextubation respiratory failure should be assessed individually. Predictors of failure could be useful to prevent delayed intubation.

PALABRAS CLAVE
Insuficiencia respiratoria aguda;
Ventilación mecánica no invasiva;
EPOC;
Insuficiencia respiratoria postextubación

Efectividad y predictores de fracaso de la ventilación mecánica no invasiva en la insuficiencia respiratoria aguda

Resumen
Objetivo: Evaluar la efectividad e identificar predictores de fracaso de la ventilación mecánica no invasiva en la insuficiencia respiratoria aguda.
Diseño: Estudio retrospectivo, longitudinal y descriptivo.
Ámbito: Pacientes adultos con insuficiencia respiratoria aguda.
Pacientes: Un total de 410 pacientes (muestra consecutiva) tratados mediante ventilación mecánica no invasiva en una unidad de cuidados intensivos de un hospital universitario terciario entre 2006 y 2011.
Intervenciones: Ventilación mecánica no invasiva.
Variables principales de interés: Variables demográficas, clínicas y analíticas desde el inicio de la ventilación mecánica no invasiva y 2 h después. Variables evolutivas durante el ingreso en la unidad y hasta el alta hospitalaria.
Resultados: El fracaso fue del 50%, y la mortalidad global del 33%. Un total de 156 pacientes presentaban insuficiencia respiratoria aguda hipoxémica, 87 insuficiencia respiratoria postextubación, 78 reagudización de enfermedad pulmonar obstructiva crónica, 61 insuficiencia respiratoria hipercápnica sin enfermedad pulmonar obstructiva crónica y 28 edema pulmonar agudo cardiogénico. El fracaso fue del 74, del 54, del 27, del 31 y del 21%, respectivamente. El tipo de insuficiencia respiratoria, la bilirrubina sérica al inicio, APACHE II, la existencia de hallazgos radiológicos, la necesidad de sedación para tolerarla y los cambios en el nivel de consciencia, ratio PaO_2/FiO_2, frecuencia respiratoria y frecuencia cardiaca entre el inicio y 2 h después se asociaron con el fracaso.
Conclusiones: La efectividad de la técnica varió dependiendo del tipo de insuficiencia respiratoria. Su uso en la insuficiencia respiratoria aguda hipoxémica y la insuficiencia respiratoria postextubación debería valorarse individualmente. Los predictores de fracaso podrían ser útiles para prevenir el retraso en la intubación orotraqueal.

Introduction

In recent years, noninvasive mechanical ventilation (NIMV) has become an alternative to orotracheal intubation and invasive mechanical ventilation for the management of respiratory failure (RF), since it can reduce the complications and shorten patient stay in the Intensive Care Unit (ICU). The first acute disorders treated with NIMV were exacerbations of chronic obstructive pulmonary disease (COPD)[1] or acute lung edema (ALE).[2,3] Since these first studies, the cumulative supporting evidence has been very consistent in reference to patients of this kind,[4] and over the last 20 years the use of NIMV has been extended to patients with other kinds of diseases,[5] such as hypoxemic RF or postextubation RF. The usefulness of NIMV in patients of this kind is much less certain, however. The latest clinical guides[6] suggest that NIMV should be the first management option in patients with exacerbated COPD or with ALE, and that NIMV may be considered in patients with postoperative RF or in immune depressed individuals. In turn, the use of NIMV should also be considered for allowing the early extubation of patients with COPD.[7] These guides offer no recommendations on the use of NIMV in patients with asthma exacerbations, acute lung injury (ALI), severe community-acquired pneumonia or thoracic trauma. Nevertheless, NIMV is often used in patients of this kind.

Considering the above, it is important to know the use of NIMV outside protocolized studies, in patients with different types of RF.

The present study has two main objectives:

- To know how NIMV is being used in clinical practice and its effectiveness.
- To identify early predictors of NIMV failure that can be used for improved indication of the technique in future patients.