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Outcome of reintubated patients after scheduled extubation☆

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Abstract

Purpose: The main objective of study was to evaluate the outcome of patients who require reintubation after elective extubation.

Materials and Methods: This is an observational, prospective cohort study including mechanically ventilated patients who passed successfully a spontaneous breathing trial. Patients were observed for 48 hours after extubation. During this time, reintubation or use of noninvasive positive pressure ventilation was considered as a failure. Reintubated patients were followed after the reintubation to register complications and outcome.

Results: A total of 1,152 extubated patients were included in the analysis. Three hundred thirty-six patients (29%) met the criteria for extubation failure. Extubation failure was independently associated with mortality (odds ratio, 3.29; 95% confidence interval, 2.19-4.93). One hundred eighty patients (16% of overall cohort) required reintubation within 48 hours after extubation. Median time from extubation to reintubation was 13 hours (interquartile range, 6-24 hours). Reintubation was independently associated with mortality (odds ratio, 5.18; 95% confidence interval, 3.38-7.94; $P < .001$). Higher mortality of reintubated patients was due to the development of complications after the reintubation.

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Conclusions: In a large cohort of scheduled extubated patients, one third of patients developed extubation failure, of whom half needed reintubation. Reintubation was associated with increased mortality due to the development of new complications after reintubation.

1. Introduction

Postextubation respiratory failure after elective discontinuation of mechanical ventilation is a common event associated with significant morbidity and mortality [1]. Reintubation, which occurs in 6% to 23% within 48 to 72 hours after planned extubation [1], is a relevant consequence of respiratory failure after extubation. Patients who require reintubation have been noted to have a significantly higher mortality rate than those who are successfully extubated on the first attempt [2,3]. Limited data are available regarding the reasons associated with mortality after extubation failure.

We studied a prospective cohort of mechanically ventilated patients who were electively extubated following current criteria for weaning. The main objective of this study was to evaluate the variables associated to mortality in reintubated patients.

2. Methods

2.1. Patients

Patients older than 18 years, who had undergone mechanical ventilation for more than 48 hours, and who had been scheduled extubated after a successful spontaneous breathing trial were enrolled from 36 intensive care units in 7 countries from September 2005 to December 2006 (see Appendix for the list of investigators). Patients with a tracheostomy were excluded. Because of the observational, noninterventionist design of the study, the research ethics board waived the need for informed consent.

2.2. Follow-up

Patients were assessed daily for the presence of the following readiness to wean criteria: (*a*) improvement in the underlying condition that lead to acute respiratory failure, (*b*) alertness and ability to communicate, (*c*) core temperature less than 38°C, (*d*) no vasoactive drugs (excluding dopamine below 5 μg/kg per minute), and (*e*) ratio Pa_{O_2} to Fi_{O_2} higher than 200 with positive end-expiratory pressure no greater than 5 cm H_2O. When patients met these criteria, a spontaneous breathing trial with T-piece, continuous positive airway pressure, or pressure support 7 cm H_2O or greater was performed. At 5 minutes and at the end of the spontaneous breathing trial, the following variables were recorded: arterial blood gases, tidal volume measured by a spirometer or the ventilator, respiratory rate, heart rate, systolic blood pressure, and the level of sedation-agitation determined by Richmond Agitation-Sedation Scale [4]. The primary physician terminated the trial if the patient had any of the following signs of poor tolerance: a respiratory frequency of more than 35 breaths/min, Sa_{O_2} below 90%, heart rate above 140 beats/min or a sustained increase or decrease in the heart rate of more than 20%, systolic blood pressure above 200 mm Hg or below 80 mm Hg, and agitation, diaphoresis, or anxiety [5]. Patients who did not tolerate the spontaneous breathing trial were placed back on mechanical ventilation. In these patients, a daily spontaneous breathing trial was performed until they were extubated. For the purpose of the study, we included in the analysis the data corresponding to spontaneous breathing trials that were followed by extubation. The decision to extubate was made by the attending physician. Patients were classified, according to the weaning process, into 3 groups: (*a*) simple weaning, which includes patients who successfully pass the initial spontaneous breathing trial and are successfully extubated on the first attempt; (*b*) difficult weaning, which includes patients who require up to 3 spontaneous breathing trial or as long as 7 days from the first spontaneous breathing trial to achieve successful weaning; and (*c*) prolonged weaning, which includes patients who require more than 3 spontaneous breathing trial or more than 7 days of weaning after the first spontaneous breathing trial [6].

Patients who tolerated the spontaneous breathing trial were extubated within next 120 minutes and followed for the next 48 hours or to discharge from intensive care unit, whichever came first. In this period, the following variables were registered: hourly respiratory rate, heart rate, systolic blood pressure, and peripheral oxygen saturation; worst Richmond Agitation-Sedation Scale and fluid balance within an 8-hour nursing shift; and daily leukocyte count and new infiltrates in the chest radiograph. During this time, reintubation or use of noninvasive positive pressure ventilation was considered as a failure. Because of the observational and noninterventionist design of the study, criteria or indication for reintubation and/or application of noninvasive ventilation was not protocolized.

In case of reintubation, we registered the date and time as well as the reason for reintubation, which was selected from the following list: (1) upper airways obstruction (defined as stridor and/or laryngeal edema); (2) increased work of breathing (defined as respiratory rate >35 breaths/min and/or use of accessory respiratory muscles); (3) decreased level of consciousness (defined as a score <0 point on the Richmond Agitation-Sedation Scale); (4) hypoxemia (defined as an