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Original Article

Differences in the prognosis among severe trauma and medical patients requiring mechanical ventilation

Luciano Santana-Cabrera, Manuel Sánchez-Palacios, Alina Uriarte Rodríguez

Department of Intensive Care, Universitary Hospital Insular in Gran Canaria, Las Palmas de Gran Canaria, Spain

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Abstract: Objetive. To find the differences between the prognosis of the patients with severe traumatism injury and those who were admitted with medical pathology who also required mechanical ventilation in our ICU. Patients and Method. Retrospective descriptive study in a polyvalent ICU of a third level hospital for a period of 8 years. Epidemiological variables such as age, sex, average stay, mortality, APACHE II at admission and days of mechanical ventilation, were analyzed in patients with severe traumatism injury and patients with medical pathology that were admitted in ICU and received mechanical ventilation during this period. Results. During the study period were admitted 208 patients with severe traumatism injury and 732 medical patients, all of them required mechanical ventilation. Patients with severe traumatism injury are more younger (41.8 vs 55.3 years, $p = 0.001$) and entered ICU in a state of minor severity, according to the prognostic index APACHE II (14.8 vs 17.4, $p < 0.001$), despite which they required more days of mechanical ventilation (9.8 vs 7.8 days, $p = 0.017$) and had a higher average stay (11.4 vs 9.4 days, $p = 0.027$), although the mortality was significantly lower (38.2% vs 28.2%, $p = 0.005$). Multivariate analysis showed as independent variables associated with mortality, the APACHE II ($p < 0.0001$), the average stay in ICU ($p < 0.0001$), days of mechanical ventilation ($p < 0.0001$) and type patient ($p = 0.016$). Conclusions. Patients with severe traumatic injury that require mechanical ventilation despite to be admitted in ICU in a state of greater severity, having an increased ICU stay and more days of mechanical ventilation, have a better prognosis than medical patients that required also mechanical ventilation at ICU stay, likely to be younger.

Keywords: Respiration, artificial, multiple trauma, patients, outcome assessment

Introduction

The need for mechanical ventilation happens in more than 30% of the admitted patients to intensive care unit (ICU), this is one of the most common indications for admission, and the mortality in these patients have been declining in the last years, where the stay in the ICU, the diagnosis and the age can influence prognosis [1-3].

Noumerous reports corresponding to the outcome of mechanically ventilated patients have appeared in the scientific literature. Studies have been typically performed in relatively small populations comprising one o several units of a group of hospitals. There is much controversy regarding outcomes, and it is difficult to extrapole conclusevily from existing reports.

Information about the mortality of patients requiring mechanical ventilation is important because it allows for better counselling of patients and their families. The relationship between pulmonary failure and mortality has been extensively evaluated in studies involving patients receiving mechanical ventilation with ARDS (adult respiratory distress syndrome), but results show considerable discrepancy [4-7].

The aim of our study was to find the differences between the prognosis of the patients with severe traumatism injury and those who were admitted with medical pathology who also required mechanical ventilation in our ICU.

Material and method

We carried out a retrospective descriptive study of adult patients admitted to ICU, from the

Table 1. Differences among severe trauma and medical patients requiring mechanical ventilation

	Medical n = 732	Trauma n = 208	p
Mean age ± SD	55.3 ± 16.6	41.8 ± 18.6	< 0.001
Female, n (%)	263 (35.7%)	40 (19.1%)	< 0.001
Mean ICU stay ± SD	9.4 ± 12.7	11.4 ± 11.3	0.027
APACHE II score ± SD	17.4 ± 7.7	14.8 ± 7.2	< 0.001
Mechanical ventilation (days)	7.8 ± 10.9	9.8 ± 10.5	0.017
ICU Mortality	281 (38.2%)	59 (28.2%)	0.005

SD: standard deviation.

Table 2. Differences between the medical and severe trauma patients who required mechanical ventilation and died

	Medical n = 281	Trauma n = 59	p
Mean age ± SD	57.7 ± 15.5	48.5 ± 20.7	0.001
Female, n (%)	107 (38.2%)	10 (16.9%)	< 0.001
Mean ICU stay ± SD	7.1 ± 10.9	5.9 ± 10.1	0.4
APACHE II score ± SD	21.4 ± 6.9	19.7 ± 6.3	0.10
Mechanical ventilation (days)	7.2 ± 10.7	6.5 ± 10.2	0.64

SD: standard deviation.

Table 3. Multivariate Analysis that studies the predictors of mortality in the ICU

	OR	IC del 95%	p
Age	1.00	(0.99-1.01)	0.45
Sex	0.96	(0.72-1.28)	0.80
APACHE II	1.13	(1.10-1.15)	< 0.0001
ICU stay	0.53	(0.48-0.59)	< 0.0001
VM Days	1.85	(1.68-2.04)	< 0.0001
Type of patient	0.79	(0.66-0.95)	0.016

OR: odds ratio; CI: confidence interval; MV: mechanical ventilation.

Emergency Department, of a third level hospital and who received mechanical ventilation for more than 24 consecutive hours, during a period of 8 years. Epidemiological variables were collected in each patient such as age, sex, average stay, mortality, APACHE (acute physiology and chronic health evaluation) II scoring system at time of admission to the ICU, and days of mechanical ventilation. We analyzed patients with severe traumatism injury and patients with medical pathology that were admitted in ICU and received mechanical ventilation during this period. Duration of mechanical ventilation was defined as the time elapsed from the initiation of ventilatory support to the extubation.

Data collection was performed after approval by the hospital's Institutional Review Board committee. In preparing this report we adhered to the STROBE statement guidelines for reporting observational studies.

Both groups were compaired using Chi-square test to analyze dichotomous variables, and Fisher test for independent samples. Data are expressed as mean ± standard deviation (SD). Logistic regression models were constructed to perform multivariate analyses. The independent variables used were those variables found to have $p < 0.05$ in univariate analysis We studied the relationship of mortality with different variables potentially associated to it by multivariable logistic regression analysis; it was used binary logistic regression tests, and results expressed as odds ratio and confidence interval 95%, and considered significant t $p \leq 0.05$. The data was analyzed using SPSS 15.0 statistical package.

Results

During the study period 3115 patients were admitted in the ICU from the Emergency Department of which 1367 patients received mechanical ventilation (43.9%). Of all patients admitted who received mechanical ventilation, 208 were patients with severe traumatism injury, 732 patients with medical pathology, 186 coronary and 241 postsurgical patients.

When we compaired the patients with severe traumatism injury with the patients with medical pathology (**Table 1**) we found that patients with severe traumatism injury were significantly younger (41.8 vs 55.3 years, $p < 0.001$) and with a higher proportion of males than patients with medical pathology. Additionally, patients with severe traumatism injury entered ICU in a state of minor severity, according to the prognostic index APACHE II (14.8 vs 17.4, $p < 0.001$), despite which they required more days of mechanical ventilation and had a higher average stay, althouth the mortality was significantly lower (38.2% vs 28.2%, $p = 0.005$).

When we analyzed dead patients in both groups we found that patients with medical conditions were older, with a greater proportion of women (38.2% vs 16.9%, $p < 0.001$), with no statistically significant differences in serious condition, according to APACHE II, or stay in the ICU, or on days that required mechanical ventilation (**Table 2**).

Multivariate analysis showed as independent variables associated with mortality, the APACHE II ($p < 0.0001$), the average stay in ICU ($p < 0.0001$), days of mechanical ventilation ($p < 0.0001$) and the type of patient ($p = 0.016$) (**Table 3**).

Discussion

The impact of mechanical ventilation on ICU resources is significant [8]. Patients who undergo mechanical ventilation are expensive to care for. It is estimated that patients receiving critical care in the United States consume at least 20% of total health-care costs; of this group those requiring mechanical ventilation are among the most resource intensive, particularly when ventilator support is prolonged [9].

Therefore, the mechanical ventilation is a very common invasive procedure used in ICU, and is associated with high morbidity and mortality, that could certainly be reduced if hospital infections were decreased [10].

Patients with traumatic injury can produce two types of ARDS, on the one hand the ARDS that takes place during the first 48 hours after hospital admission due to blood polytransfusion, and on the other the ARDS that occurs later which is associated with multiple organic failure and the pneumonia. The global mortality of patients developing either is similar, although there are studies that find that the survival was shorter in patients who developed ARDS 48 hours after the start of mechanical ventilation [1].

Our study we found higher mortality in the group of medical patients, which were older than trauma. In the older ventilated population is less satisfactory the outcome both from clinical and economic perspectives [11]. Age has an important effect on outcome from mechanical ventilation, although other factors, such as ICU stay and diagnosis also influence outcome, and age should not be used as a sole criterion in evaluating the potential benefit of mechanical ventilation to an individual patient [12]. Studies show that elderly patients spent similar time on mechanical ventilation and in the ICU and hospital but had a lower cost of cares than younger patients so they suggest that mechanical ventilation should not be restricted in elderly patients with respiratory failure on the basis of chronologic age [13]. Older survivors recovered from respiratory failure and achieved spontaneous breathing at the same rate as younger patients but had greater difficulty achieving liberation from the ventilator and being discharged from the ICU [14].

In our study also found a predominance of men mechanically ventilated as reported in other studies [1, 15]. The influence of gender on outcome from mechanical ventilation has not been well studied. Some studies suggest that differences in outcome from mechanical ventilation can occur that are independent of severity of illness although another studies suggest that important gender specific differences in outcome do not occur among patients with respiratory failure requiring mechanical ventilation; severity of illness, age and acquired organ system derangements appear to be the most important determinants of mortality for patients with acute respiratory failure, regardless of patient gender [16]. More long term studies are required to determine wheter gender specific differences in quality of life or functional status occur following mechanical ventilation.

We must address several limitations of our study. First, have not p02/Fi02 levels at the start of mechanical ventilation. Second, we don't know how many patients in each group required mechanical ventilation for respiratory problems or problems at the level of consciousness; in some studies the reason for the initiation of mechanical ventilation influences the outcome of ventilated patients, so Esteban et al after adjusting for other variables, the only factors independently associated with decreased survival were coma, ARDS, and sepsis, and the only factor independently associated with increased survival was postoperative state [1]. Third, we either do not have the rate of hospital-acquired pneumonias acquired by these patients during their stay in the UCI, since mortality increase by ICU-acquired pneumonia and primary bloodstream infections [17, 18]. Fourth, we examined only patients requiring invasive mechanical ventilation and not ICU patients requiring non invasive mechanical ventilation, as some studies with careful selection of patients have demonstrated clear benefits of non invasive mechanical ventilation [19, 20]. Finally, we only took into account chronic illness according to APACHE II criteria and did not account other comorbidities to influence outcome as the chronic obstructive pulmonary disease, alcoholism, diabetes mellitus, and chronic heart failure, which were shown to be related with poor outcome [21-23].

Future investigations should be directed at confirming these results necessary to elucidate the outcome difference between these two groups.

Conclusion

In conclusion, patients with severe traumatic injury that require mechanical ventilation despite to be admitted in ICU in a state of greater severity, having an increased ICU stay and more days of mechanical ventilation, have a better prognosis than medical patients that required also mechanical ventilation at ICU stay, likely to be younger.

Address correspondence to: Dr. Luciano Santana-Cabrera, Department of Intensive Care, Universitary Hospital Insular in Gran Canaria, Avenida Marítima del Sur s/n, Las Palmas de Gran Canaria, Canary Islands, Spain, Postal Code: 35016. Tel: (34) 928441392; E-mail: lsancabx@gobiernodecanarias.org

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