

Successful versus failed transition from controlled mechanical ventilation to assisted mechanical ventilation in COVID-19 patients: a case-match retrospective study.

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Purpose: Assisted mechanical ventilation (AMV) is an alternative mode of ventilation also in the acute phase of respiratory failure, resulting in a valid alternative to controlled mechanical ventilation (CMV). The correct timing of the transition from CMV to AMV is crucial, with a potential impact on patient outcomes. In this observational study on COVID-19-induced ARDS, we aim to identify predictors and early indicators of the failure of transition from CMV to AMV and the outcomes of patients who failed.

Methods: Our population includes patients admitted to 24 ICUs from northern Italy from February 2020 to May 2020. Data were derived from a prospective registry (2019nCOV_ICU, NCT04388670). We defined the “failure of assisted breathing” if the patient was switched back from AMV to CMV within 72h.

Results: 514 patients were included in the analysis: 357 patients succeeded, and 157 failed. Timing of the switch was not different in patients who failed or succeeded (7 ± 6 vs. 7 ± 6 days, p-value = 0.803), while $\text{PaO}_2/\text{FiO}_2$ ratio was the only independent predictor of a successful transition (OR 1, 95% CI 0.99-1.00, p-value = 0.003). Across the transition to AMV, patients in the success group showed a more favorable evolution of $\text{PaO}_2/\text{FiO}_2$, PaCO_2 , plateau, and peak pressure (**Fig 1**). The subject in the failure group presented worse outcomes in terms of 60 days ICU mortality (HR 2.08, 95% CI 1.42–3.06, p-value <0.001), reduced probability of breathing without assistance (HR 0.54, 95% CI 0.39–0.76, p-value <0.001), ICU length of stay (success vs. failure, 21 ± 14 vs. 27 ± 17 days, p-value <0.001) and duration of MV (19 ± 18 vs. 24 ± 17 , p-value = 0.04).

Conclusions: Our study highlights that no baseline characteristics or duration of CMV prior to the switch are associated with failure transition to AMV. $\text{PaO}_2/\text{FiO}_2$ ratio before the transition is an independent predictor of a successful transition. A worse evolution of $\text{PaO}_2/\text{FiO}_2$, PaCO_2 , plateau, and peak pressure in the early phase of transition to AMV could promptly suggest a failure of switching associated with a worse outcome.

Clinical implications: $\text{PaO}_2/\text{FiO}_2$ ratio levels should be considered before switching to AMV as it may predict weaning failure. $\text{PaO}_2/\text{FiO}_2$, PaCO_2 , pH, plateau, and peak pressure changes over time should be closely monitored in the early phases of the transition to AMV as they may warn of a higher risk of weaning failure.

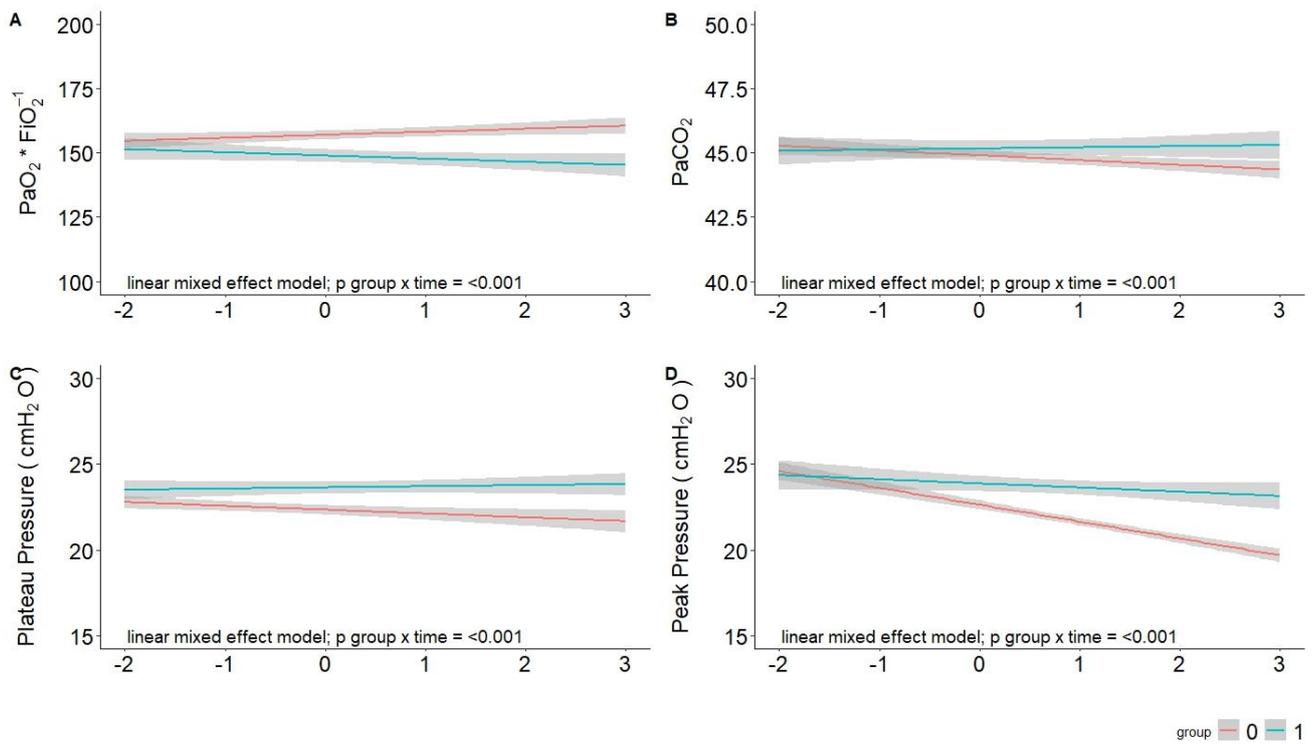


Figure 1. A linear mixed model with patients as random effects: Panel A PaO₂/FiO₂, Panel B PaCO₂, Panel C PIP, Panel D Plateau. Group 0 = Success vs group 1 (Failure). Time 0 represents the moment of the transition to assisted mechanical ventilation.