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Differential Impact of Static Lung Compliance on Need for Reintubation in Mechanically Ventilated COVID-19 Positive and Negative Patients

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Rationale: The decision to liberate from mechanical ventilation (MV) remains the result of multi-disciplinary discussion based on imperfect clinical tools such as the rapid shallow breathing index and spontaneous breathing trials. We have previously shown that static lung compliance (Cp) can help identify patients at high risk of reintubation despite meeting traditional criteria. In this study, we hypothesized that low Cp may not explain the reintubation risk in the distinct pathophysiologic scenario of COVID-19. **Methods:** This was a retrospective, multi-center analysis of COVID-19-negative (Dec. 2017-Dec. 2019) and -positive patients (Mar.-Oct. 2020) who required MV and were liberated during the same admission (excluding compassionate extubation). Cp was calculated on the day of extubation. The rate of reintubation within 72 hours was compared across groups and multivariate logistic regression was used to explore the impact of Cp after adjustment for age, sex, body mass index and admission Sequential Organ Failure Assessment (SOFA) score. **Results:** A total of 2263 non-COVID-19 and 161 COVID-19 patients were included (mean age 65.8 ± 16.4 vs 62.3 ± 13.4 [$p < 0.01$]; male 55.8% vs 52.2% [$p = 0.37$]). Mean Cp and the proportion with Cp < 50 was similar in the two groups (mean 46.0 ± 32.8 vs 43.0 ± 30.8 [$p = 0.25$] and 70.1% vs 72.7% [$p = 0.5$]). Admission SOFA score was higher for the COVID-19 group (median 9 [7-11] vs 5 [3-7]; $p < 0.01$). More reintubations were observed among COVID-19 patients (21.7% vs 12.1%; $p < 0.01$). In the non-COVID-19 population, Cp < 50 was associated with a higher percentage of reintubation (13.6% vs 8.6% [$p < 0.01$]) and independently increased the risk in a multivariate model (adjusted odds ratio [aOR], 1.63; 95% confidence interval [95% CI] 1.2-2.2). By contrast, in the COVID-19 group, no significant difference in reintubations was noted between the two compliance subgroups (15.9% vs 23.9% for Cp < 50; $p = 0.27$). Similarly, Cp < 50 did not significantly predict reintubation in the multivariate model (aOR, 1.64; 95% CI 0.64-4.20). **Conclusion:** Decreased lung compliance may aid in identifying patients at risk for reintubation in cases of respiratory failure requiring MV from causes other than COVID-19. In the latter population, other factors such as more severe extra-pulmonary disease likely play a greater role in predicting reintubation. Studies to prospectively explore the value of lung compliance in guiding extubation decisions are warranted.

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