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indications or protocols, their results should be interpreted with caution. Furthermore, the study that Dr Mitchell cites to support the greater mortality rate associated with initial noninvasive ventilation in patients with ARDS found this difference only in patients with a $\text{PaO}_2/\text{FiO}_2$ ratio ≤ 150 .² The mean baseline $\text{PaO}_2/\text{FiO}_2$ ratio in the Fernando study was approximately 100, which was a study population possibly too ill to benefit from proning. Interestingly, the overall mortality rate (40%) of patients treated with HFNC in the Fernando study, whether proned or not, was not much higher than the 30% mortality rate reported for patients with $\text{PaO}_2/\text{FiO}_2$ ratio ≤ 200 who were treated with HFNC in the Florali study.³ Not bad for such an ill cohort, which suggests that HFNC may have helped avoid intubation and mortality rates in these very ill patients with ARDS due to COVID pneumonia, even if proning did not add to the benefit. If delayed intubation increased the mortality rate in the HFNC + proning subgroup, one might have expected a higher mortality rate than in the nonproned subgroup, which was not the case.

We agree in general with the caveats raised by Dr Mitchell. Our review was clear in recommending awake proning only in patients with mild-to-moderate hypoxemia and warned against delaying needed intubation. We agree that high-quality studies are needed to clarify if we can safely apply awake proning to more severe forms of acute respiratory failure.

Additionally, the pathophysiologic condition of ARDS may vary in subgroups of patients with distinct pathologic processes so that the limitations of noninvasive respiratory support in patients with ARDS may need to be reevaluated in patients with COVID-19 acute respiratory failure.⁴ For example, a multicenter observational study showed that noninvasive techniques, combined with prone positioning in 51% of the cases, was associated with mortality and intubation rates of $<30\%$ for a $\text{PaO}_2/\text{FiO}_2$ ratio of 152, which was much lower than described in intubated patients with a similar $\text{PaO}_2/\text{FiO}_2$ ratio.⁵

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References

1. Ferrando C, Mellado-Artigas R, Gea A, et al. Awake prone positioning does not reduce the risk of intubation in COVID-19 treated with high flow nasal oxygen therapy; a multicenter, adjusted cohort study. *Crit Care*. 2020;24(1):597.
2. Bellani G, Laffey J, Pham T, et al. Noninvasive ventilation of patients with acute respiratory distress syndrome. *Am J Respir Crit Care Med*. 2017;195(1):67-77.
3. Frat JP, Thille AW, Mercat A, et al. High-flow oxygen through nasal cannula in acute hypoxemic respiratory failure. *N Engl J Med*. 2015;372(23):2185-2196.
4. Grasell G, Tonetti T, Protti A, et al. Pathophysiology of COVID-19-associated acute respiratory distress syndrome: a multicentre prospective observational study. *Lancet Respir Med*. 2020;8(12):1201-1208.
5. Franco C, Facciolo N, Tonelli R, et al. Feasibility and clinical impact of out-of-ICU noninvasive respiratory support in patients with COVID-19-related pneumonia. *Eur Respir J*. 2020;56(5):2002130.

Insights About Prone and Lateral Positioning in Spontaneously Breathing Patients With COVID-19 Pneumonia Undergoing Noninvasive Helmet CPAP Treatment



To the Editor:

The work by Retucci et al¹ in *CHEST* (December 2020) about the change of position during spontaneous breathing and COVID-19 pneumonia with ratio of arterial oxygen partial pressure to fractional inspired oxygen less than 250 is very interesting. A shift in position (prone or lateral), in the first 2 hours of treatment, is the principal mechanism of action in the recruitment of lung tissue, especially during noninvasive helmet CPAP. In their study, the association between CPAP use and the radiologic pattern (particularly GGO prevalence or consolidation) is not obvious.

In fact, in the pattern ground-glass opacification/opacity, the response is very quickly correlated with \dot{V}/\dot{Q} matching or edema formation. Still, this benefit should disappear immediately when the patient is repositioned in the supine position, as shown in Retucci et al's work.¹ Rather than improvements in \dot{V}/\dot{Q} matching, no variation of the lung ultrasound pattern before and after prone noninvasive ventilation has been detected in the study.² In the consolidative pattern, the response is unpredictable, especially if the thickened areas are peripheral and posterior. The pronation may interrupt the process of progressive basilar atelectasis and rapid deterioration.³ However, this could be challenging in COVID-19 patients with obesity. An approach to overcome this issue is a pregnancy massage pillow, which is essentially an inflatable pillow with a cut-out to allow for a protuberant abdomen. In the prone position, this support allows release of abdominal pressure on the chest.

Another clinical problem is the patient's prone position compliance and interface use. The helmet is the most advantageous and safest interface to give a CPAP, but it is difficult to use in prone patients.³ The most likely complications caused by prone positioning (eg, vomiting or nausea in patients with pancreatic or abdominal problems in general) would have been clinically evident. In the last period, during low-pressure CPAP use, there is a lot of pneumomediastinum and pneumothorax incidence. It is a real problem for the change of position and prone position, especially during nondrained pneumomediastinum and the placement of any drainages in patients who would require the prone position should be carefully evaluated.

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References

1. Retucci M, Aliberti S, Ceruti C, et al. Prone and lateral positioning in spontaneously breathing patients with COVID-19 pneumonia undergoing noninvasive helmet CPAP treatment. *Chest*. 2020;158(6):2431-2435.
2. Zarantonello F, Andreatta G, Sella N, Navalesi P. Prone position and lung ventilation and perfusion matching in acute respiratory failure due to COVID-19. *Am J Respir Crit Care Med*. 2020;202(2):278-279.
3. Barker J, Koeckerling D, West R. A need for prone position CPR guidance for intubated and non-intubated patients during the COVID-19 pandemic. *Resuscitation*. 2020;151:135-136.

Response



To the Editor:

We thank Dr Fiorentino and coworkers for their interest in our recently published experience on prone and lateral positioning in spontaneously breathing patients with COVID-19 pneumonia undergoing noninvasive helmet CPAP treatment.¹ Noninvasive ventilation (NIV) and noninvasive CPAP have been extensively used during the COVID-19 pandemic, as documented by several observational studies published over the past few months, although no randomized controlled studies have been designed to investigate their safety and efficacy in this specific population.^{2,3} Different clinical challenges of prone and lateral positioning in spontaneously breathing patients with COVID-19 pneumonia undergoing NIV/CPAP treatment should be acknowledged, including an adequate patients' selection and the correct use of the interface. First, Dr Fiorentino and coworkers accurately underlined the crucial role of both radiology and lung ultrasounds in identifying potential responders. However, we should also acknowledge potential difficulties in performing chest CT scans in patients with severe COVID-19 as well as the low specificity of lung ultrasounds in deeply characterizing the interstitial pattern of a COVID-19 pneumonia. Second, the identification of a positive physiological response to the application of positive end-expiratory pressure during helmet CPAP treatment along with optimal levels of positive end-expiratory pressure is of paramount importance. Recent data documented a successful lung recruitability test in fewer than 30% of COVID-19 patients undergoing CPAP, and these tests also should be considered in clinical practice in patients undergoing prone and lateral positioning to document safety and efficacy of this intervention.⁴ Third, the management of the interface, either facemask or helmet, during NIV/CPAP should be optimized during prone and lateral