



Efficacy and feasibility of awake proning in patients with COVID-19-related acute hypoxaemic respiratory failure: exploring both sides of the same coin

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Dear Editors:

We would like to thank Mukherjee and his colleagues [1] for the review and the valid and important points highlighted in their comments.

COVID-19 pneumonitis hit healthcare systems globally in early 2020 as a novice disease with lack of knowledge on both the pathophysiology and therapeutic approaches. Clinicians used therapeutic options which have been established in the treatment of hypoxic respiratory failure from different causes to treat such patients; however, there remain debates whether COVID-19 pneumonitis is typically classic of acute respiratory distress syndrome (ARDS) or similar to ARDS with ‘happy hypoxaemic’ patients as a distinct feature compared to classic ARDS [2, 3]. To date, there is ongoing research to understand the different phenotypes of the disease [4].

Our study was an observational report whereby we studied the oxygenation parameters, respiratory parameters, and work of breathing change in patients as well as tolerability and feasibility of the procedure in a reasonable sample size of 50 patients. To our knowledge, while there were previous similar studies, these studies represented small sample size. In addition, it was speculated in the literature that proning conscious patients with other causes of ARDS improves their oxygenation [5].

The ROX index is an index used to measure the composition of oxygenation and work of breathing using either SPO₂/

PO₂: RR to identify patients at low risk for high-flow nasal cannula (HFNC) failure in whom therapy can be continued after 12 h [6]. However, we feel that this is not validated in COVID-19 pneumonia as the work of breathing is not always proportionate to the degree of hypoxic respiratory failure. In fact, we speculate that this was the main reason why many published studies did not use ROX index to study the effect of awake proning and its feasibility in COVID-19 patients [7, 8]. However, further studies are required to confirm this hypothesis.

Physiologically, the HFNC and noninvasive ventilation (NIV) may be beneficial in patients with early ARDS. However, their mechanism of action is different. NIV applies two different pressures during inspiration and expiration. HFNC provides a small positive pressure spike at end-expiration that depends on the nasal airflow and the extent of mouth opening. The mechanism of improvement in oxygenation is thought to be different in both modalities. The essential role of both modalities in ARDS is to support the oxygenation in order to avoid intubation of these patients. However, they do not address the underlying pathophysiological changes in ARDS [9, 10]. High level of inspiratory pressure set on NIV together with deep inspiratory efforts could generate high tidal volumes and excessive trans-pulmonary pressures, increasing lung stress and contributing to VILI [11]. Nevertheless, combining NIV or HFNC to prone position can add the benefit to ARDS patients by improving the ventilation perfusion matching, enhancing the drainage of secretions, and better homogeneity in the lung zones [11].

The oxygen delivery interface, whether it NIV or HFNC, and positive end expiratory pressure (PEEP) were not changed before or after proning, which we thought might impact the oxygenation parameters if changed pre- and post-proning. The study cited by the authors revealed that early proning combined with HFNC/NIV may avoid the need for intubation in up to half of the patients with moderate to severe ARDS; when prone position (PP) was added,

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$\text{PaO}_2/\text{FiO}_2$ increased by 25 to 35 mmHg compared with the prior HFNC or NIV, and PP was safely performed and well tolerated by moderate ARDS patients. Despite being consistent with our results in the COVID-19 cohort, this was a very small sample size of only 20 patients and we are not sure whether the effects of HFNC or NIV remain the same in COVID-19 patients or not, as the effects they have shown were observed in classic ARDS patients. Therefore, we agree with the comment put forward and further trials should be performed to address this point.

We agree that some prone patients might lose their recruitment post de-proning; however, we observed that this is not the case for every patient. Many patients have sustainable improvement in oxygenation, and others may require further proning sessions which are the common scenario in ARDS patients who may require up to 4–8 sessions as in PROSEVA trial [12]. We left the decision for further proning sessions to the clinical discretion of the attending physician depending on the response.

The main problem in COVID-19 patients was the hypoxemic respiratory failure, and we have seen patients who came in with tachypnea and hyperventilation to higher tidal volumes when connected to NIV. Hypercapnia has never yet been documented to be a major feature in classic COVID-19 pneumonitis. In the fourth comment, the permissive hypercapnia in severe ARDS patients is probably related to severe ventilation/mismatch, while COVID-19 pneumonitis is a predominant diffusion issue that affects oxygenation as opposed to hypercapnia.

The prone positioning is not a complication-free procedure; however, the COVID-19 patients who required awake proning were treated by either HFNC or NIV which meant that there was no intubation and usually stable in terms of hemodynamics i.e. no central lines or multiple infusions. Moreover, the patients were awake, and they could communicate if they cannot tolerate the prone position. I think the authors meant the pressure side effects in a ventilated patient who is sedated, paralyzed, and prone for 18 h or sometimes more, although PROSEVA trial [12] has shown no significant increase in adverse events in the prone group.

The study by Cammarota and his colleagues [13] included only 20 patients which we think needs further studies with bigger sample size to generalize these findings and to study whether these changes in diaphragmatic thickness are related to COVID-19 disease or secondary to mechanical ventilation

in ARDS. We did not use the ultrasound to examine diaphragmatic thickening; thus, we feel that the comments, while valid, is not relevant to our study.

Declarations

Conflict of interest The authors declare no competing interests.

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