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Barotrauma in critically ill patients with COVID-19: the more we learn, the less we know! Response to the commentary

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Dear Editor,

We thank the authors of the commentary [1] for their comprehensive analysis of the article [2] and for raising some pertinent points. The authors correctly point out that the flow rate setting is an important factor in the use of a high-flow nasal cannula (HFNC), with low flow rates facilitating patient comfort and ease of use, and higher flow rates being more effective at improving oxygenation [3]. We followed our institutional protocol of starting with a flow rate of 60 L min^{-1} and titrating it as per patient tolerance and oxygenation status. While transoesophageal pressure monitoring can accurately reflect respiratory dynamics, it was not performed in our patient subset owing to limited feasibility in the COVID ICU.

We followed the standard of care for mechanical ventilation in our patients, i.e., low tidal volume and lung-protective ventilation in accordance with the ARDSNet Protocol [4]. Positive end-expiratory pressure (PEEP) was titrated according to arterial blood gas and clinical status of the patient as per the decision of the treating clinician. While higher PEEP is undoubtedly a risk factor for barotrauma in non-COVID acute respiratory distress syndrome (ARDS), its relevance in COVID ARDS is unclear. Chong *et al.* [5] performed a systematic review of the literature to study the characteristics of pneumothorax in hospitalised COVID patients. The authors found that while only two studies described the respiratory variables (PEEP, peak inspiratory pressure, plateau pressure, and tidal volume) in detail, these studies found no increase in these parameters in patients who developed pneumothorax. Furthermore, the authors reported several case series with no association between increase in respiratory variables and pneumothorax, in addition to two case series with an unexpected inverse relation between PEEP and incidence of pneumothorax. The authors surmised that disease-induced lung frailty and underlying disease severity are more likely to be responsible for barotrauma than ventilatory settings [5].

The use of a combination of clinical examination and imaging modalities for diagnosis of barotrauma was in keeping with the usual clinical practice followed in the ICU. In our study, we included subcutaneous emphysema and bronchopleural fistula in the definition of barotrauma events [2]. These may be detected clinically, such as by the presence of a palpable crepitus or observation of bubbling through intercostal drain [6]. As per institutional protocol, chest radiographs were performed daily and when otherwise indicated, such as after placement of central venous catheters or in cases of acute clinical deterioration. We accept that CT is more sensitive at detecting smaller extra-alveolar gas collections. Because ours was an observational study, CT was performed only when clinically indicated, and this may have led to a few missed barotrauma events. This had been listed as a limitation of the study [2]. Larger studies with a greater number of patients are

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required to gain greater insight into the complexities of the COVID pathophysiology.

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