

volutrauma are required to obtain a solid method for the early detection of inflammation following volutrauma.

Competing Interests

The authors declare no competing interests.

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In Reply:

We thank Dr. Mahmoodpoor and Dr. Golzari for their interest in our work¹ on the early detection of lung injury related to volutrauma during mechanical ventilation. They highlight the limitations of the short time course of ventilation in our study and the analysis of volutrauma-related biomarkers in blood. Although 60 min of mechanical ventilation is certainly a short period of time, this time frame is supported by previously reported significant increases in blood of interleukin (IL)-1 receptor antagonist, IL-6, IL-10, and tumor necrosis factor within 60 min of initiation of large tidal volume ventilation in adults² and of tumor necrosis factor- α , IL-1 β , and IL-6 within 15 min after recruitment maneuvers in children.³ Prior studies have also shown changes in neutrophil elastase and Clara Cell protein 16 plasma levels within 1 to 3 h of ventilation in animal models^{4,5} and humans.⁶ Blood measurements of the

latter biomarkers have been extensively used in the literature of lung injury because of their reliable lung source.^{7–9} In our healthy surgical patients, we have shown that tidal volume differentially affects plasma levels of neutrophil elastase and Clara Cell 16. We believe that these data can be used as a reference for future studies. Similarly, although bronchoalveolar lavage fluid may better reflect lung inflammation, its serial collection is not devoid of risks and interpretation challenges that make it suboptimal for healthy surgical patients. We pursued these analyses in exhaled breath condensate samples, a technique that poses its specific challenges but is noninvasive, repeatable, and safe. Our understanding of the early development of ventilation-mediated lung injury in patients is incomplete, and developing safe and clinically relevant plasma and exhaled breath condensate surrogates is a rational strategy.

Competing Interests

The authors declare no competing interests.

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