

LETTER

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Does inspiration of exhaled CO₂ explain improved oxygenation with a face mask plus high-flow nasal cannula oxygen in severe COVID-19 infection?

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Dear Sir,

I read with interest the research letter by Dogani et al. [1] on the improvement in arterial oxygenation in spontaneously breathing patients with severe COVID-19 infection requiring high-flow nasal cannula oxygen (80% O₂ at 40 l/min) with the application of a simple oxygen mask but with no further O₂ added. The resultant striking rise in SpO₂ from 90 to 95% in eighteen patients was associated with a non-significant 0.15 kPa (1.1 mmHg) rise in PaCO₂ and a non-significant fall in respiratory rate of 2 breath/min. The authors ascribe these changes to some degree of elimination of ambient air entrainment by the mask such that the effective F_IO₂ was higher. While no argument can be made against this interpretation as a contributor, it is unlikely that with an already very high inspiratory flow rate of 40 l/min that minimization of ambient air entrainment with respiratory rates in the 20s fully explains the improvement. Another possibility is re-inspiration of exhaled CO₂. This would be consistent with the slight rise in PaCO₂. Addition of inspired CO₂ improves regional ventilation-perfusion matching and oxygenation with unchanged minute ventilation and tidal volume [2] by its several actions on pulmonary vascular resistance, airways resistance and parenchymal compliance [3]. Additionally, even the slight rise in PaCO₂ stimulates ventilation by increasing tidal volume which will

reduce V_D/V_T and dead space ventilation by decreasing the fraction of the inspired volume needed to clear the anatomic (conducting airways) dead space. Whatever the explanation(s) the finding, if verified in other studies, is clinically important. Adding a mask is easy to administer and in situations of oxygen scarcity, a simple means to reduce use of a limited resource.

Acknowledgements

None.

Authors' contributions

As sole author I wrote the entirety of this letter. The author read and approved the final manuscript.

Funding

Not applicable to a letter to the editor in response to a published paper.

Availability of data and materials

Not applicable to a letter to the editor in response to a published paper.

Declarations

Ethics approval and consent to participate

Not applicable to a letter to the editor in response to a published paper.

Consent for publication

As sole author I give my consent to publish this letter.

Competing interests

The author declares no competing interests in the subject matter of this letter.

Received: 6 September 2021 Accepted: 7 September 2021

Published online: 20 September 2021

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