

# Non-invasive Ventilation Delivered by Helmet vs Face Mask in Patients with COVID-19 Infection: Additional Measures to Reap Further Benefits

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We have read with great interest this study<sup>1</sup> where the authors have found helmet masks to be a reliable interface and more advantageous than face mask non-invasive ventilation (NIV) in terms of a lower rate of intubation, better oxygenation with greater patient comfort, and shorter intensive care unit (ICU) stay. Although they have done nice work, we consider that there are certain points that need further clarification.

First, the authors assessed the oxygenation status with PaO<sub>2</sub>/FiO<sub>2</sub> ratio. We are curious whether they have utilized also the respiratory rate-oxygenation (ROX) index, a composite measure of "oxygenation" (PaO<sub>2</sub>/FiO<sub>2</sub>) and "work of breathing" (respiratory rate), that can serve as the physiological antecedents to deterioration and can be a strong predictor of complications with a severe outcome, as well as mortality<sup>2</sup> ROX index calculated before starting continuous positive airway pressure (CPAP) and within 24 hours of initiation can differentiate patients with coronavirus disease-2019 (COVID-19)-related acute hypoxemic respiratory failure (AHRF) who are likely to wean or fail CPAP.<sup>2</sup> Serial monitoring of ROX index over time can further increase the prognostic potential.<sup>2</sup>

Second, Saxena et al.<sup>1</sup> have used gas flow at more than 60L/minute. Sound pressure levels can increase from 52 to 74 dB when the gas flow was raised from 20 to 40L/minute.<sup>3</sup> The permissible level of noise in ICU is between 45 and 60 dB during the day and 35 dB during the night as per WHO guidelines.<sup>4</sup> We are interested to know whether they have measured the noise level, considered it while assessing the patient comfort, and simultaneously adopted a "bundle of interventions"<sup>4</sup> rather than relying on earplugs alone to protect their patients. A higher level of noise certainly contributes to higher patient discomfort and influences the patient's well-being as well.

Third, although they have monitored blood gases at 6 hours intervals, the data regarding arterial blood gas (ABG) is not available. Continuous positive airway pressure can improve hypoxemia by improvement of lung compliance and reducing the work of breathing. This can be reflected as a decrease in respiratory alkalosis with serial ABG in such patients.<sup>5</sup>

Fourth, as air leak during NIV reduces performance, we wonder about what measures were adopted by the authors to minimize the air leak in helmet masks.<sup>6</sup>

Fifth, the prone position improves oxygenation with NIV. It would be interesting to know, how long the patient was kept prone as was mentioned in the discussion.<sup>7</sup>

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Last, but not the least, we are also interested to know whether the authors adopted any special technique to measure the tidal volume during the use of helmet CPAP because the high tidal volume has a higher risk of self-induced lung injury with a worse clinical outcome while it is not an easy task to measure tidal volume in helmet mask owing to its mechanical properties.<sup>6</sup>

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