Should We Monitor Pulsus Paradoxus via Pulse Oximetry in COVID-19 Patients with Acute Respiratory Failure?

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Key words

Covid-19, acute respiratory failure, pulsus paradoxus, pulse oximetry, respiratory effort.

Words

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To the Editor:

We read with interest the study by Tonelli et al. (1) in which they assessed the inspiratory effort of 30 patients with de novo respiratory failure. The inspiratory effort was quantified by measuring the respiratory swings in esophageal pressure (ΔPes). Their findings suggest that the lack of inspiratory effort relief within the first 2 hours of non-invasive ventilation (NIV) is an early and accurate predictor of NIV failure at 24 hours. In practice, patients in whom ΔPes does not decrease by > 10 cmH_2O after initiating NIV finally require tracheal intubation.

We agree with Tonelli et al. (1) that there is a need for an early robust predictor of NIV failure to avoid intubation delay. Such delay may lead to self-inflicted acute lung injury (2). Indeed, persistently strong spontaneous inspiratory efforts simultaneously increase tissue stresses and raise pulmonary transvascular pressures, vascular flows, and fluid leakage (2,3). This phenomenon has recently been advocated to explain, at least in part, the rapid deterioration of lung function in COVID-19 patients (3).

The study by Tonelli et al. (1) suggests that ΔPes may be a robust predictor of NIV failure and may help clinicians in the decision-making process of tracheal intubation. However, we are concerned by the fact that esophageal probes are rarely used and often poorly tolerated in spontaneously breathing patients with acute respiratory failure. Therefore, although Tonello's findings make a lot of sense from a physiologic standpoint, we are afraid that the clinical applicability of their esophageal tonometry approach may be limited.

Respiratory swings in pleural pressure induce swings in the arterial pulse, which are known as the Pulsus Paradoxus. A Pulsus Paradoxus is classically observed during

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asthma crisis and its magnitude is known to reflect the severity of the attack. Cyclic respiratory changes in the arterial pulse are reflected by proportional changes in the pulse oximetry waveform (4). We are well aware that the magnitude of the respiratory swings in the pulse oximetry waveform (aka the Pleth Variability Index, PVI) is dependent on volume status and may significantly increase during surgical bleeding (5). However, in patients with acute respiratory failure, PVI depends almost exclusively on the magnitude of changes in pleural pressure, i.e on the respiratory effort. In this respect, PVI has been proposed to assess the expiratory effort in patients with airway obstruction (6). We believe it may be also used to assess the inspiratory effort during acute respiratory failure related to bacterial or viral pneumonia. All hypoxemic COVID-19 inpatients are monitored with a pulse oximeter, that, in addition to oxygen saturation, could be used to quantify their pulsus paradoxus or PVI (Figure 1). In other words, PVI monitoring may constitute an elegant and practical alternative to the quantification of ΔPes and assist clinicians in the timing of tracheal intubation. Studies are needed to confirm this hypothesis and to clarify which PVI cut-off value would correspond to the best discriminative value of 10 cmH_2O reported by Tonelli et al. (1) for ΔPes.

Declaration of interests:

FM is the founder and managing director of MiCo, a Swiss consulting and medical research firm, which acts as a consultant for medical technology companies, but does not sell any medical products; he does not own shares from any medtech company. KS has no conflict of interest to declare.

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Figure 1. Modern pulse oximeters enable the monitoring of the respiratory pleth variability (pulsus paradoxus or PVI)

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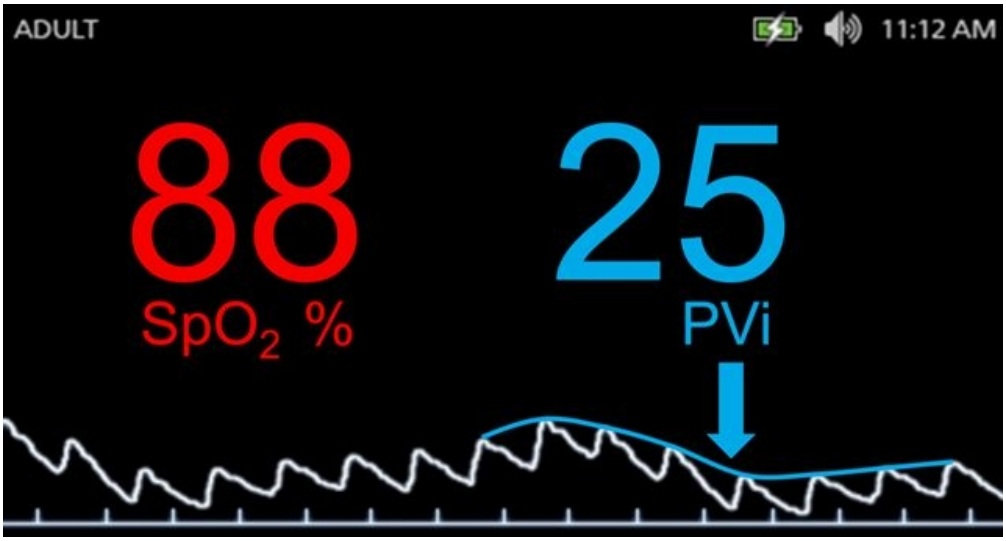

Modern pulse oximeters enable the monitoring of the respiratory pleth variability (pulsus paradoxus or PVI)

169x90mm (96 x 96 DPI)

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