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Editor—We report an unusual record of exhaled CO$_2$ observed during end-expiratory occlusion in a chronic obstructive pulmonary disease patient receiving invasive mechanical ventilation because of a severe acute exacerbation attributable to a bacterial pneumonia. As the patient fulfilled moderate acute respiratory distress syndrome criteria, he was deeply sedated and under neuromuscular block. The 70-yr-old male patient was ventilated (assist-controlled) with a CARESCAPE R860 ventilator (GE Healthcare, Madison, WI, USA). An end-expiratory occlusion manoeuvre was performed to determine the total PEEP level. The duration of the expiratory pause was extended to 15 s, because of the clinical observation of a very unusual record (Fig. 1a). The airway CO$_2$ monitoring system (sidestream sampling, aspiration flow 120 ml min$^{-1}$ as indicated by the manufacturer) displayed at first a so-called ‘curare cleft’ and further a short ‘plateau-like’ line, rapidly followed by a decrease in CO$_2$ fraction, associated with an increase in measured airway O$_2$ fraction. Indentations were observed during the decreasing phase at a rate very similar to the cardiac frequency. Such a pattern was repeatedly observed over time, even after switching to another CARESCAPE R860 ventilator. Moreover, prolonged expiration was additionally obtained by disconnection of the respiratory line at the Y-piece level, immediately after the port of the CO$_2$ monitoring device and the ventilator was also ruled out because it would have been associated with a decrease in O$_2$ fraction, attributable to exposure to a gas mixture with 21% fractional inspired O$_2$, contrasting with the observed increase in O$_2$ fraction (Fig. 1a). Therefore, we believe that the pattern was attributable to contamination by fresh gas on the ventilator side. We assume that

An unusual sidestream capnogram

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**Declaration of interest**

None declared.

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Editor—We report an unusual record of exhaled CO$_2$ observed during end-expiratory occlusion in a chronic obstructive pulmonary disease patient receiving invasive mechanical ventilation because of a severe acute exacerbation attributable to a bacterial pneumonia. As the patient fulfilled moderate acute respiratory distress syndrome criteria, he was deeply sedated and under neuromuscular block. The 70-yr-old male patient was ventilated (assist-controlled) with a CARESCAPE R860 ventilator (GE Healthcare, Madison, WI, USA). An end-expiratory occlusion manoeuvre was performed to determine the total PEEP level. The duration of the expiratory pause was extended to 15 s, because of the clinical observation of a very unusual record (Fig. 1a). The airway CO$_2$ monitoring system (sidestream sampling, aspiration flow 120 ml min$^{-1}$ as indicated by the manufacturer) displayed at first a so-called ‘curare cleft’ and further a short ‘plateau-like’ line, rapidly followed by a decrease in CO$_2$ fraction, associated with an increase in measured airway O$_2$ fraction. Indentations were observed during the decreasing phase at a rate very similar to the cardiac frequency. Such a pattern was repeatedly observed over time, even after switching to another CARESCAPE R860 ventilator. Moreover, prolonged expiration was additionally obtained by disconnection of the respiratory line at the Y-piece level, immediately after the port of the CO$_2$ monitoring device. We then observed the expected pattern, with a slow CO$_2$ fraction ascending rate, but without reaching a true plateau (Fig. 1b).

The decrease in CO$_2$ fraction during the extended expiratory pause could be in relation to contamination of the gas sampling by fresh inspiratory gas. A leak between the port of the CO$_2$ monitoring device and the patient was ruled out by the pattern (increase in CO$_2$ fraction) observed after disconnection at the Y-piece (Fig. 1b). A leak between the port of the CO$_2$ monitoring device and the ventilator was also ruled out because it would have been associated with a decrease in O$_2$ fraction, attributable to exposure to a gas mixture with 21% fractional inspired O$_2$, contrasting with the observed increase in O$_2$ fraction (Fig. 1a). Therefore, we believe that the pattern was attributable to contamination by fresh gas on the ventilator side.
the contamination was in relation with the specific configuration of the CARESCAPE R860 ventilator, with a minimal flow-by circuit set at 2 litres min$^{-1}$. Accordingly, the aspiration flow of the sidestream CO$_2$ monitoring system was nearly twice the flow measured between the CO$_2$ sampling port and the patient. The oscillations observed in the waveforms were probably related to the cardiac beats in a patient under neuromuscular block with low pulmonary compliance, with adiabatic compressions and decompressions, or both.

To the best of our knowledge, this is the first report of such a capnographic pattern during a prolonged end-expiratory occlusion manoeuvre. The pattern was probably explained by the sidestream (rather than mainstream) CO$_2$ monitoring system and by a minimal flow-by circuit set at 2 litres min$^{-1}$ leading to frank contamination of the sampled gas by fresh gas issued from the ventilator. Clinicians must be aware of this pattern, because it could considerably underestimate end-tidal CO$_2$ fraction. This is of particular importance in circumstances in which capnographic monitoring has been considered of value, such as pulmonary embolism diagnosis,$^2$ cardiopulmonary resuscitation,$^3$ or acute respiratory distress syndrome.$^4$ Such patterns could also explain, in part, the disappointing results observed for end-expiratory occlusion CO$_2$-based prediction of fluid responsiveness in the operating theatre.$^5$

**Authors’ contributions**

Conception, design, and acquisition of data: J.-L.D., C.C., E.G.
Analysis and interpretation of data, drafting the article for important intellectual content, and final approval: J.-L.D., C.C., A.M., J.C.R., E.G.

**Declaration of interest**

J.-L.D. has received technological support from GE Healthcare for the Physiological Study of Minimally Invasive ECO2R in Exacerbations of COPD Requiring Invasive Mechanical Ventilation (EPHEBE) study (NCT02586948). J.-C.R. receives a part time salary from Air Liquide Medical Systems and has received fee for lectures from Vygon, Covidien. The other authors have no conflicts of interest to be declared.

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doi: 10.1093/bja/aex113