

## Incomplete (135°) prone position as an alternative to full prone position for lung recruitment in ARDS during ECMO therapy

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### To the Editor,

A 44-year-old man (185 cm, 80 kg) was mechanically ventilated and referred to a university hospital because of severe pneumonia-associated acute respiratory distress syndrome (ARDS; Fig. 1a). A few hours after intensive care unit admission, veno-venous extracorporeal membrane oxygenation (ECMO; outflow cannula—23 Fr: right femoral vein; inflow cannula—19 Fr: right internal jugular vein) had to be initiated because of refractory hypoxemia (PaO<sub>2</sub>, 53 mmHg) and hypercapnia (PaCO<sub>2</sub>, 144 mmHg) regardless of invasive ventilator settings (biphasic positive airway pressure with inspiratory oxygen concentration, 100%; positive end-expiratory pressure, 15 mbar; peak pressure, 36 mbar; respiratory rate, 32 bpm). To hasten lung recruitment, the decision was made to put the patient into the prone position. However, full prone position led to compression of lines at their insertion site by the patient's weight, compromised extracorporeal blood flow and lowered the efficacy of ECMO therapy despite of placing the patient on a special anti-decubitus matress (TheraKair®; KCI, Vienna, Austria). The patient was then placed in the incomplete (135°) prone position, which was well tolerated and did not lead to any reductions of extracorporeal blood flow (5 L min). Following two 16-h sessions of incomplete prone positioning with the right lung up, right-sided lung recruitment was achieved (Fig. 1b) with relevant improvements in gas exchange (oxygen concentration of extracorporeal

gas flow, 100→70%; inspiratory oxygen concentration, 70→45%) and dynamic lung compliance (23→45 mL/mbar). Another 16-h session of incomplete prone positioning with the left lung up, resulted in left-sided lung recruitment (Fig. 1c) and further improvements in gas exchange (oxygen concentration of extracorporeal gas flow, 70%; inspiratory oxygen concentration, 30%) and dynamic lung compliance (62 mL/mbar). Six days after admission, ECMO therapy could be withdrawn, and the patient was extubated 2 days later. He made an uneventful recovery.

The prone position improves oxygenation and reduces mortality in severe ARDS [1, 2]. Three studies including a total of 36 patients have reported on the use of the prone position also in ARDS patients during ECMO therapy [3–5]. Although complications related to the extracorporeal circuit were not observed in any of these studies, our case shows that prone position may not allow for full extracorporeal blood flow in some patients. In these selected patients, the incomplete prone position at 135° could be a meaningful alternative to the full prone position. The patient presented in this letter experienced effective lung recruitment in response to 135° prone positioning. As impressively shown by the radiologic evolution of bilateral opacities in Fig. 1, lung recruitment can occur only sequentially during incomplete prone positioning. Therefore, it seems recommendable to use left- and right-sided 135° prone positioning alternatively.

### Informed consent

Informed consent was obtained from the patient for publication of this letter to the editor.

### Conflict of interest

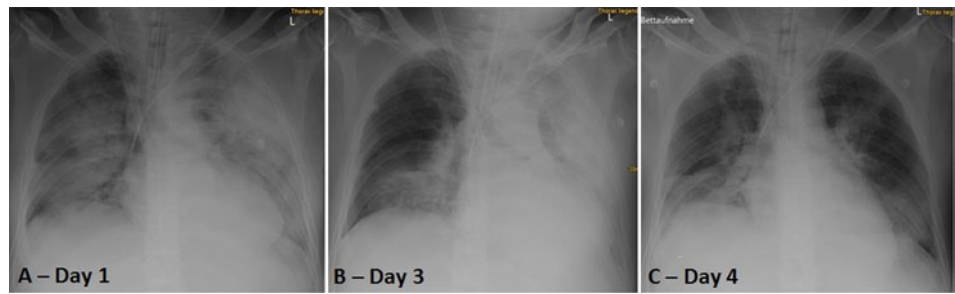
The authors declare that there is no conflict of interest.

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**Fig. 1** Chest x-ray after start of veno-venous ECMO therapy (a), after two sixteen hours sessions of incomplete prone positioning with the right lung up (b), and after another sixteen hours session of incomplete prone positioning with the left lung up (c).



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