Rita Jacobs
Patrick M. Honore
Herbert Spapen

Look before leaping into combining extracorporeal techniques to improve oxygenation!

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Dear Editor,

We would like to comment on the recently published case study by Zhang et al. on incorporating a continuous renal replacement therapy (CRRT) circuit into a venoarterial extracorporeal membrane oxygenator (VA-ECMO) [1]. Their reported findings must be interpreted with great caution. First, the type of ECMO treatment used is questionable. As indicated by the authors, the patient presented with neurogenic pulmonary edema, which is a typical non-cardiogenic acute respiratory distress syndrome (ARDS). No data on cardiac function were provided. According to the Extracorporeal Life Support Organization guidelines, VA-ECMO should be applied exclusively in cardiac failure, whereas venovenous ECMO is first-line therapy for refractory or life-threatening hypoxemia in patients with preserved or drug-sustained cardiac function [2, 3]. Venoarterial venous (VAV) ECMO is

most appropriate to secure upper body oxygenation in case of severe myocardial dysfunction. Peripheral arterial cannulation for VAV-ECMO is feasible, yet a central approach better “synchronizes” perfusion to oxygenation needs by more closely regulating oxygenated blood return to the coronary and cerebral circulation [2, 3]. Second, the high metabolic oxygen demands of ARDS patients can only be met by providing a high (i.e., between 3 and 7 L/min) ECMO blood flow rate. ECMO flow rates of 500–1500 mL/min effectively remove CO₂ from the circulation but are unsuited for oxygenation purposes. Thus, implementing a CRRT device at a “meagre” blood flow rate of 300 mL/min into an ECMO circuit clearly is inadequate for improving oxygen supply [3, 4]. Third, embedding a CRRT device in series with an ECMO circuit may have significant drawbacks [5]. Optimal performance of CRRT requires convenient anticoagulation therapy. Recent guidelines recommend the use of regional citrate as first-choice anticoagulant. A CRRT-ECMO combination inevitably will enhance citrate clearance. Eventual resulting premature clotting is harmful because it reduces filter and circuit life-span, predisposes to hemodynamic instability, and leads to treatment inefficacy (e.g., prolonged downtime) and unwarranted blood loss [5]. In addition, increased shear stress, physical properties of the bypass circuit, the roller pump, and the hemofilter enhance red blood cell damage and lysis [5]. A hemolysis-induced rise of plasma-free hemoglobin and subsequent hemoglobinuria adversely affect renal tubular function and may cause acute

kidney injury or delay renal recovery [2, 5].

Compliance with ethical standards

Conflicts of interest The authors declare to have no competing interests.

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R. Jacobs · P. M. Honore (✉) · H. Spapen
ICU Department, Universitair Ziekenhuis
Brussel, Vrije Universiteit Brussel, 101,
Laarbeeklaan, Jette, 1090 Brussels, Belgium
e-mail: Patrick.Honore@az.vub.ac.be
Tel.: 003224749097