Inhaled isoflurane for deep sedation during venovenous ECMO in severe acute respiratory distress syndrome: a case report

Authors: Dolores Amitrano; Martina Flamini Marczuk; Federico Carlos Carini ; Sonia Villarroel Mendoza;

Affiliation: Adult Critical Care Unit, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina.

Background

Deep sedation is frequently required during venovenous extracorporeal membrane oxygenation (VV-ECMO) to control severe patient–ventilator dyssynchrony while using lung protective ventilation strategies However, prolonged exposure to intravenous sedatives may cause drug accumulation, delayed awakening and impaired rehabilitation. Experience with inhaled isoflurane during ECMO, particularly in patients with very low tidal volumes, remains limited.

Objective

To describe the feasibility, technical challenges, and sedative-sparing effect of inhaled isoflurane in a patient with severe ARDS receiving VV-ECMO.

Methods

We report a 19-year-old woman with systemic lupus erythematosus who developed diffuse alveolar hemorrhage and severe ARDS. After intubation, her PaO_2/FiO_2 ratio was 80 and VV-ECMO was initiated by a mobile ECMO team before transfer to our center. Deep sedation targeting a Richmond Agitation-Sedation Scale score of −4 to −5 was required because of severe ventilator dyssynchrony. Despite propofol and midazolam infusions and intermittent neuromuscular blockade, stable sedation was difficult to maintain. Isoflurane was therefore administered using an anesthetic-conserving device (1). Clinical response, intravenous sedative requirements, device configuration, serum fluoride, renal function, and outcomes were recorded.

Results

Tidal volumes below 250 mL initially required a distal device configuration and higher isoflurane delivery to maintain an end-tidal concentration between 0.3–0.5%. This increased anesthetic consumption and the frequency of canister and scavenging-filter replacement. As tidal volume improved to approximately 400 mL, the device was moved to a proximal configuration, simplifying administration and weaning. Isoflurane allowed discontinuation or marked reduction of intravenous sedation(1), avoiding approximately 3,600 mg/day of propofol and 240 mg/day of midazolam for nearly 48 hours. Peak serum fluoride was 20 µmol/L, without hypernatremia or deterioration in renal function (3) (4). The first ECMO run lasted 6 days; a second 11-day run was required after respiratory deterioration. The patient survived and was discharged after 142 days.

Conclusion

Prolonged high-dose IV sedation can delay weaning and rehabilitation, worsening long-term outcomes and quality of life (4) Inhaled isoflurane was feasible as rescue deep sedation during VV-ECMO and substantially reduced intravenous sedative exposure. Very low tidal volumes imposed relevant technical and logistical challenges, highlighting the importance of device configuration, anesthetic-delivery monitoring, scavenging-system management, and staff training.

References

1. Jerath A, Ferguson ND, Steel A, et al. Inhaled volatile anesthetics for ICU sedation: a systematic review. *Crit Care*. 2015;19:150.
2. Röhm KD, et al. Renal effects of long-term isoflurane sedation. *Crit Care*. 2008;12:R21.
3. Wagner BK, et al. Inorganic fluoride concentrations during isoflurane sedation in the ICU. *Anesth Analg*. 2010;110:1469–73.
4. Shehabi Y, Bellomo R, Mehta S, et al. Sedation practices in intensive care: minimizing harm. *Intensive Care Med*. 2013;39:731–43.