Dear Sir,

Critically ill children and neonates undergoing extracorporeal membrane oxygenation (ECMO) often require deep sedation. Intravenous sedative drugs are largely used in this population, but side effects can be an issue. Volatile anesthetics can be used to provide adequate sedation without the main side effects of intravenous drugs. Volatile anesthetics have a low solubility and a reduced accumulation in tissues. They appear to be good candidates for deep sedation in patients undergoing ECMO. Nonetheless, only a few case reports are available in children and neonates.  

Case Description

We report the case of a 2-year-old patient, with a medical history of congenital diaphragmatic hernia complicated by bronchopulmonary dysplasia and persistent pulmonary hypertension requiring home oxygen therapy and oral sildenafil. When she was 2½ years old, she presented a severe pneumonia secondary to a Metapneumovirus infection and developed acute respiratory distress syndrome (ARDS) with worsening of her pulmonary hypertension and respiratory condition. Despite protective mechanical ventilation, pulmonary vasoactive therapy (inhaled and infused), profound analgesia, and neuromuscular blocker treatment, she developed a refractory cardiogenic shock and required to be put on ECMO. During her stay in our unit, we faced issues with her sedation and analgesia management. She was under high doses of opioids (morphine), benzodiazepines (midazolam), ketamine, and α2-agonist (dexmedetomidine). We also tried unusual therapy such as continuous infusion and bolus of propofol and phenobarbital. Despite optimal use of all these drugs, we could not reach a satisfactory relief of pain and discomfort of propofol and phenobarbital. Despite optimal use of all these drugs, we could not reach a satisfactory relief of pain and discomfort.

After initiating sevoflurane, her vital constants significantly improved. The mean heart rate decreased from 155 bpm to 95 bpm. Sevoflurane allowed her to be released and we were able to wean her from certain drugs.

Conclusion: Anesthesia using sevoflurane with the AnaConDa-S device is efficient for children under ECMO.

Clinical significance: This is the first pediatric report on anesthesia with sevoflurane under ECMO.

Keywords: Anesthesia, Extracorporeal membrane oxygenation, Halogenous gas, Sevoflurane.

Indian Journal of Critical Care Medicine (2020): 10.5005/jp-journals-10071-23487
135 bpm and the mean blood pressure from 80 mm Hg to 65 mm Hg. Bispectral index (BIS) values were significantly lower ($p < 0.0001$) after initiating sevoflurane (Fig. 2). We were able to wean her from ketamine, dexmedetomidine, and pentothal. While on sevoflurane, the amount of sedation she was receiving was reassessed every 6 hours, and we decreased them if she had a satisfactory comfort scale evaluation (11–17 points). This attitude was kept until the end of her stay in our unit (Table 1, Fig. 3).

The ECMO blood flow and sweep gas flow were not modified by the adjunction of this treatment. We did not modify her previous apneic ventilation settings (peak pressure of 24 cm H$_2$O, positive end expiratory pressure of 10 cm H$_2$O, and respiratory rate of 20 cycles per minute). Echocardiography remains unchanged and no new organ dysfunction was identified after sevoflurane initiation. Measurements were obtained directly from the expiratory circuit. There was no air contamination in the patient’s room according to the measurements we performed.

Due to the severity of her condition and the absence of improvement, the decision of limitation of her life-sustaining treatments was taken by the medical staff. She died after 2 months in our unit.

We described here the first pediatric patient under venoarterial ECMO sedated by sevoflurane with the AnaConDa-S device. Meiser et al.$^2$ described a case series of six adult patients undergoing ECMO but so far, to our knowledge, no sedation by the sevoflurane AnaConDa-S device was reported in a pediatric patient under ECMO.

Those last years, concerns about neurotoxicity of volatile anesthetics were reported.$^3$ However, these concerns from

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**Table 1:** Doses of sedation before and after introduction of inhaled sevoflurane

<table>
<thead>
<tr>
<th></th>
<th>24 hours before Sevo</th>
<th>12 hours after Sevo</th>
<th>24 hours after Sevo</th>
<th>36 hours after Sevo</th>
<th>48 hours after Sevo</th>
<th>60 hours after Sevo</th>
<th>72 hours after Sevo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midaz μg/kg/hours</td>
<td>400</td>
<td>200</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Morph mg/kg/day</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Keta mg/kg/hours</td>
<td>3.75</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Sufl μg/kg/hours</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Pentol mg/kg/hours</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Dexme μg/kg/hours</td>
<td>1.4</td>
<td>0</td>
<td>0</td>
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In our opinion, the use of inhaled isoflurane or sevoflurane, with a dedicated mechanical ventilator and a tight monitoring of the expired fraction, should be considered in case of an uncomfortable patient despite high doses of sedative drugs.

REFERENCES


